AMERICAN
STATISTICAL ASSOCIATION

NEW SERIES, No. 107. SEPTEMBER, 1914.

THE OCCUPATION HAZARD OF LOCOMOTIVE FIREMEN.

By Henry J. Harris.

The occupation hazard of any employment is now a matter in which the general public is taking an ever-increasing interest. The recent wave of accident insurance legislation in the United States has called attention to the high accident rate in many of our industries and occupations; in the recent arbitration of a wage controversy between locomotive engineers and their employers, emphasis was placed on the fact that the trade life of the locomotive engineer was but from ten to twelve years; the presidents of two prominent trade unions not long ago urged that the protection of such organizations was necessary to prevent men from being thrown on the scrap heap at an early age under present-day conditions. We know so little, however, about the hazard of occupations and the length of working life at the present time that any attempt to measure the loss of a group of employees caused by accident, sickness, and general loss of working power from conditions peculiar to an occupation is usually blocked by the absence of any accurate information on these subjects.

For a few occupations there does exist a certain amount of scattered information which, when brought together, throws considerable light on this question. Among such, the occupations of locomotive firemen and locomotive engineers have frequently been studied from various points of view. By comparing the material collected from time to time by different agencies, one can obtain an estimate of the special risks and general hazard of these occupations which is sufficiently accurate to form the basis for some general conclusions in regard to the occupational hazard of the employment. The

study of the occupation of locomotive firemen is rendered difficult by the fact that it is as a rule a preliminary occupation, because most firemen are in the course of time promoted to the position of engineer. Partly on this account, the statistics of the Interstate Commerce Commission usually combine all men employed on trains in the reports of accidents, while in the federal mortality returns, all steam railroad employees are reported in one total. For this reason, it has been necessary to use the statistical data furnished by special studies and by sources less comprehensive than the federal statistics, or the returns of the Registrar-General of Great Britain.

Extent of the Occupation.

The occupation returns of the census of 1910 present the class of locomotive firemen separately for the first time in the history of the census. The following table shows the figures for this occupation together with those for the locomotive engineers:

TABLE I.

NUMBER OF LOCOMOTIVE FIREMEN AND ENGINEERS IN THE CENSUS OF 1910, BY AGE GROUPS AND PARENTAGE.

(Source: Thirteenth Census of the United States, 1910, Vol. IV., Population-Occupation Statistics, pp. 416, 417.)

Age Groups and Parentage.	Locomotive Firemen.	Locomotive Engineers.
Total	76,381	96,229
Age groups:		
14 to 15 years	19	.....
16 to 20 years	6,627	891
21 to 44 years (including age unknown)	66,257	66,605
45 years and over	3,478	28,733
Native white:		
Native parentage	49,674	62,672
Foreign or mixed parentage	15,108	23,062
Foreign-born white	6,395	10,133
Negro	5,188	355
Indian, Chinese, Japanese, and all others	16	7

The number of locomotive firemen in the United States as given above is 76,381. The report contains the warning that the enumerators did not always separate the stationary firemen and stationary engineers from those employed on locomotives so that the above total may be slightly in excess of the actual number, which may be assumed to be about 75,000 men. The number of members of the Brotherhood of Locomotive

Firemen and Enginemen on December 31, 1910, was 73,469; in 1911 it was 79,942 and in 1912 it was 85,292.* As the organization includes a number of locomotive engineers, the figures are in substantial agreement with the census returns.

The general characteristics of the firemen's group are that it consists entirely of males, that it is a young men's occupation (the number over 44 years of age is only about 3,500 out of the total of 75,000), that the great majority (two thirds) are descended from American-born parents and that only about 6,000 of the 75,000 were foreign born.

The general characteristics of the firemen group, therefore, are such as would produce a favorable death-rate. This tendency is enhanced by the fact that applicants for employment as firemen are usually subjected to a careful medical examination by the surgeons of the railroad companies† and all applicants with physical defects or below a high standard of physique are rejected.

The Mortality of Locomotive Firemen.

One of the most definite indications of the general hazard of an occupation consists of the death-rate of those engaged in that occupation. For locomotive firemen we have several computations of the death-rate. These computations were made by life insurance companies or by life insurance actuaries, and the rates compiled are based on their experience in insuring the lives of men engaged in this occupation. It is well to call attention to the fact that the persons insured are carefully selected by the insurance companies so that the group whose lives furnished the basis for these rates is composed of men of more than average prudence, selected by prudent insurance companies and engaged in an occupation in which only persons of excellent physique are employed. The death-rate for the occupation of locomotive firemen ought therefore to be a favorable one.

The Medico-Actuarial Investigation. The most recent study of the mortality of hazardous occupations in America is that entitled "Medico-Actuarial Mortality Investigation." It

* Eastern Concerted Wage Movement, p. 276.

† For a typical form used in such examinations, see the New York Central Railroad blank reprinted in Eastern Concerted Wage Movement, p. 391.

was made by the Association of Life Insurance Medical Directors and the Actuarial Society of America and included the experience of the leading American life insurance companies. Only those occupations were included for which the number of deaths was large enough to form the basis of a rate. The following table gives a summary of the data for all the railroad occupations included in this investigation:

TABLE II.

ACTUAL AND EXPECTED NUMBER OF DEATHS OF LOCOMOTIVE FIREMEN AND OTHER RAILWAY EMPLOYEES ACCORDING TO THE MEDICO-ACTUARIAL INVESTIGATION.

(Source: Medico-Actuarial Mortality Investigation, 1913. Vol. III, pp. 132-141.)

Ages at Entry.	Railway Locomotive Firemen.		Railway Locomotive Engineers.		Railway Check Clerks, Freight Inspectors, Car Inspectors, Car Sealers, Yard Clerks and Yard Masters.		Railway Passenger Trainmen (not Conductors).		Railway Track Supervisors and Foremen. Section Foremen.	
	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.
15-29	141	70.28	86	45.00	58	43.87	40	24.56	74	64.85
30-39	42	24.96	243	150.74	71	52.46	24	18.04	170	129.15
40-49	7	5.67	147	94.08	62	34.03	7	8.03	111	86.38
50-59	3	.93	62	42.64	29	23.08	4	4.09	56	40.99
60 and over	.....	.....	3	4.92	1	3.48	1	.80	10	11.70
Total	193	101.84	541	337.38	221	156.92	76	55.52	421	333.07
	RATIO OF ACTUAL TO EXPECTED DEATHS.									
15-29	201	100.0	191	100.0	132	100.0	163	100.0	114	100.0
30-39	168	100.0	161	100.0	135	100.0	133	100.0	132	100.0
40-49	123	100.0	156	100.0	182	100.0	87	100.0	129	100.0
50-59	323	100.0	145	100.0	126	100.0	98	100.0	137	100.0
60 and over	.....	100.0	61	100.0	29	100.0	125	100.0	85	100.0
Total	190	100.0	160	100.0	141	100.0	137	100.0	126	100.0

It should be stated that the "expected deaths" in the preceding table are those calculated by the M. A. Table, which will be found in the reports in Vol. I, page 89 and Vol. III, page 27.

The committee in charge of the investigation state that "generally the excess of the mortality ratio over 100 per cent. indicates the extent of the extra mortality due to the particular occupation in question" (Vol. III, page 6). The hazard of the firemen's occupation is, by the preceding table, shown to be

about 90 per cent. above the average of the persons accepted by the larger American life insurance companies. Of all the railway occupations included in the investigation, the firemen show the highest risk, though it must be remembered that certain occupations, *e. g.*, brakemen, undoubtedly have a higher risk and are accepted in such small numbers that the computation of a rate was not feasible. The group of locomotive engineers shows a distinctly lower hazard than the firemen; the difference, it will be noted, occurs in the younger age groups of the firemen. At the ages of entry, 15 to 29, the ratio for the engineers is 191 per cent. and for the firemen 201 per cent., and at ages 30 to 39 it is 161 per cent. and 168 per cent. respectively. Of the total policies 79 per cent. were issued to the firemen at ages 15 to 29, and 19 per cent. at ages 30 to 39, against 24 per cent. and 52 per cent., respectively, to the engineers.

The Specialized Mortality Investigation. An earlier investigation of the mortality of hazardous occupations, generally referred to as the "Specialized Mortality Investigation" which was conducted by the Actuarial Society of America, shows the same general tendencies among the railway employees.* Because of the omission of certain types of risks, this study does not give as accurate results as the Medico-Actuarial Investigation, but the data are of value as showing the relative hazard of the occupations included, which comprise some not given in the later investigation. The following table summarizes the returns for all the occupations in this study connected with railroading:

* Experience of thirty-four life companies upon ninety-eight special classes of risk, Compiled and published by the Actuarial Society of America, New York, 1903.

TABLE III.

ACTUAL AND EXPECTED NUMBER OF DEATHS OF LOCOMOTIVE FIREMEN AND OTHER RAILWAY EMPLOYEES AS COMPUTED BY THE ACTUARIAL SOCIETY OF AMERICA.

(Source: Experience of thirty-four life companies upon ninety-eight special classes of risk, p. 473.)

Ages at Entry.	Railway Locomotive Firemen.		Railway Locomotive Engineers.		Railway Express Messengers.		Railway Mail Clerks.		Railway Passenger Trainmen.		Railway Passenger Conductors.	
	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.	Actual Deaths.	Expected Deaths.
15–28	37	21.2	29	22.9	13	16.5	24	28.9	9	5.5	33	30.2
29–42	20	14.0	135	108.7	13	17.8	31	37.3	12	8.4	122	136.3
43–56	3	2.7	55	37.3	7	3.9	9	13.0	3	2.2	49	35.7
57–70	1	.2	1	4.3	1	.1	1	1.5	.....	.3	3	4.6
15–70	61	38.1	220	173.2	34	38.3	65	80.7	24	16.4	207	206.8

RATIO OF ACTUAL TO EXPECTED DEATHS.

15–28	175.9	100.0	126.6	100.0	78.8	100.0	83.0	100.0	163.6	100.0	109.3	100.0
29–42	142.8	100.0	142.2	100.0	73.0	100.0	83.1	100.0	142.9	100.0	89.5	100.0
43–56	111.1	100.0	147.5	100.0	179.5	100.0	69.2	100.0	136.4	100.0	137.3	100.0
57–70	500.0	100.0	23.2	100.0	100.0	100.0	66.7	100.0	.....	100.0	65.2	100.0
15–70	160.1	100.0	127.0	100.0	88.0	100.0	80.5	100.0	146.3	100.0	100.1	100.0

The expected deaths in the above table are practically identical with Farr's Healthy English Male Table; the revised form of this table (as used in this study) will be found on page XIV of the report. The highest mortality is shown by the firemen with a ratio of actual to expected deaths of 160 per cent.; the passenger trainmen with 146 per cent. come next, while the locomotive engineers with a ratio of 127 per cent. rank third.

Experience of the New York Life Insurance Company. Similar results are shown by the study of Mr. Arthur Hunter, the actuary of the New York Life Insurance Company, based on the experience of that company.* In that company the ratio of actual to expected deaths for locomotive firemen was 174 per cent., for locomotive engineers 145 per cent. Mr. Hunter remarks "the mortality among those insured as firemen appears to be much higher than among those insured as engineers, although it is hard to find an entirely satisfactory reason for such a considerable difference."

* Transactions of the Actuarial Society of America, May, 1907, Vol. 10, No. 37.

Change of Occupation. In all of these actuarial studies, where the occupation is given as fireman, it means that such was the occupation when the policy was taken out, and this designation is retained in computing the death-rate even when the insured person was actually employed as an engineer at the time of his death. This fact, however, does not detract from the value of the tables as much as it might at first appear, because of the very high death-rates in the first few years after the insurance is taken out. The following table emphasizes this point:

TABLE IV.

ACTUAL AND EXPECTED DEATHS OF LOCOMOTIVE FIREMEN ACCORDING TO THE MEDICO-ACTUARIAL INVESTIGATION.

(Source: Medico-Actuarial Mortality Investigation, Vol. III, p. 137.)

Insurance Years.	Age at Entry 15-29.				Age at Entry 30-39.			
	Exposed to Risk.	Actual Deaths.	Expected Deaths.	Ratio per cent.	Exposed to Risk.	Actual Deaths.	Expected Deaths.	Ratio per cent.
1-5...	11,759	104	48.82	213	3,158	24	14.67	164
6-7...	2,028	14	9.92	141	661	6	3.71	162
8-10..	1,546	14	7.72	181	653	6	3.99	150
11-15.	643	9	3.42	263	334	6	2.44	246
16-24.	67	.....	.40	.....	16	.....	.15	.....
1-24..	16,043	141	70.28	201	4,822	42	24.96	168
	40-49.				50-59.			
1-5...	376	2	2.68	75	40	1	61	164
6-7...	86	3	.86	349	7	1	16	625
8-10..	77	2	.94	213	5	1	.16	625
11-15.	48	.....	.82	.....	.....	.....	.....	.....
16-24.	13	.....	.37	.....	.....	.....	.....	.....
1-24..	600	7	5.67	123	52	3	.93	323
	60 and Over.				All Ages at Entry.			
1-5...	.....	.....	.....	.....	15,333	131	66.78	196
6-7...	.....	.....	.....	.....	2,782	24	14.65	164
8-10..	.....	.....	.....	.....	2,281	23	12.81	180
11-15.	.....	.....	.....	.....	1,025	15	6.68	225
16-24.	.....	.....	.....	.....	96	.....	.92	.....
1-24..	.....	.....	.....	.....	21,517	193	101.84	190

The preceding table shows that the firemen's mortality rate is based on 193 deaths and that of these deaths, 131 occurred within five years after the policy was issued; the detailed tables of the investigation also show that 107 of the 193 deaths occurred in the first three years after the issue of the policy. It is safe to claim, therefore, that the rates of the various

actuarial studies are sufficiently accurate for present purposes as showing the high mortality of the occupation.

Mortality of Brotherhood of Locomotive Firemen. The death-rate of the membership of the Brotherhood of Locomotive Firemen and Enginemen also illustrates the hazard of the occupation, though as the figures include both firemen and engineers, they do not show a definite rate for firemen. The following table was prepared by the officers of the insurance organization of the Brotherhood:

TABLE V.

DEATHS AMONG THE MEMBERS OF THE BROTHERHOOD OF LOCOMOTIVE FIREMEN AND ENGINEMEN, 1882-1912.

(Source: Eastern Concerted Wage Movement, page 333.)

Years.	Number of Members.	Number of Deaths.	Deaths per 1000 Members.
1882	5,125	12	2.341
1883	7,888	44	5.578
1884	12,246	54	4.409
1885	14,849	74	4.973
1886	16,196	98	6.051
1887	17,047	81	4.751
1888	18,278	110	6.018
1889	17,087	127	7.432
1890	18,657	159	8.468
1891	22,460	190	8.459
1892	25,967	190	7.317
1893	28,681	226	7.878
1894	26,508	200	7.545
1895	21,408	129	6.026
1896	22,461	160	7.123
1897	24,251	145	5.919
1898	27,039	201	7.433
1899	30,748	220	7.155
1900	36,084	265	7.344
1901	39,072	300	7.678
1902	43,376	354	8.161
1903	48,568	647	13.321
1904	54,434	453	8.322
1905	55,287	496	8.971
1906	58,849	461	7.833
1907	62,916	581	9.234
1908	66,408	437	6.579
1909	65,315	412	6.308
1910	73,469	520	7.077
1911	79,942	523	6.542
1912	85,292	561	6.577

Estimate of the Occupation Hazard by Life Insurance Practice. The attitude of the larger life insurance companies towards the occupation of locomotive firemen has been determined by the facts just presented. Some of the companies refuse entirely to accept firemen while others accept them under certain restrictions. The New York Life Insurance Company, for

instance, in its circular of instructions to agents (Form 1519, issued May, 1912), explains that insurance will be accepted for certain hazardous occupations, but subject to the restriction that the applicant for insurance must pay the premiums for a higher age, and if the occupation is unusually hazardous, may be given only the endowment form of insurance. The circular (page 11) specifies that passenger conductors, express messengers, telegraphers, and train despatchers may be accepted at their actual age and may be given the regular life policies. Locomotive engineers must have 8 years added to their actual age and may receive no cheaper policy than a 20-year endowment. Locomotive firemen, however, must have 12 years added to their actual age and may receive no cheaper policy than a 20-year endowment.

Comparison with other Occupations. Of the occupations included in the medico-actuarial investigation, the mortality rate of firemen is exceeded only by certain occupations connected with mining and stonecutting; in addition, it is the highest of any of the railway occupations given in the report. To show the relation of the firemen's death-rate to those of other occupations, the following table presents, with two exceptions, all of the occupations included in the medico-actuarial investigation; the exceptions are, first, the numerous occupations connected with the liquor traffic, omitted as not being of interest in the present connection, and second, those occupations whose excess over the normal death-rate was less than 25 per cent.

* The rules of a large number of American life companies on this point are cited in Eastern Concerted Wage Movement, pp. 338–

TABLE VI.

MORTALITY RATES OF HAZARDOUS OCCUPATIONS.

(Source: Medico-actuarial Mortality Investigation, Vol. 3, pp. 28-31.)

Group Number.	Occupation.	Actual Deaths.	Expected Deaths.	Ratio of Actual to Expected Deaths.
44	Underground mines other than coal mines working miners	642	283.66	226
188	Stone-cutters, journeymen	76	35.45	214
42	Surface mines—placer, drift, hydraulic, etc. working miners	70	33.72	208
45	Coal mines: working coal miners (anthracite)	66	34.55	191
58	Railways: locomotive firemen, excluding issues prior to 1890	193	101.84	190
53	Potteries: employees molding potter's clay (excluding foremen and superintendents)	28	16.45	170
43	Underground mines other than coal mines: foremen and bosses	54	32.12	168
64	Structural iron works (including house-smiths and bridge-builders)	74	43.96	168
41	Surface mines—placer, drift, hydraulic, etc.: foremen and bosses	23	14.38	160
57	Railways: locomotive engineers, excluding issues prior to 1890	541	337.38	160
47	Navy—commissioned officers (excluding chaplains, physicians, surgeons and paymasters)	149	97.79	152
13	Fire departments, city: firemen, laddermen, pipemen and hosemen	155	104.55	148
16	Glass industry: bevelers, grinders, engravers and cutters of glass, excluding foremen and superintendents	77	52.60	146
66	Theaters: actors (including vaudeville performers, but excluding acrobats and circus performers)	87	60.15	145
11	Electric light, heat and power systems: linemen (pole climbers) and arc light trimmers	71	50.05	142
59	Railways: check clerks, freight inspectors, car inspectors, car sealers, yard clerks and yard masters	221	156.92	141
50	Police and prisons: city policemen	526	377.67	139
190	Steam vessels: officers and engineers in coastwise trade, excluding those traveling to the tropics	34	24.69	138
56	Railways: passenger trainmen (not conductors) excluding issues prior to 1890	76	55.52	137
68	Theaters: proprietors, managers and treasurers of theaters, music halls and vaudeville houses	153	112.66	136
39	Underground mines—supervision: engineers, superintendents and managers occasionally going under ground (excluding coal mines)	268	197.99	135
17	Hatters, journeymen, excluding straw-hatters	84	62.74	134
51	Police and prisons: marshals, sheriffs and constables (excluding chief sheriffs not exposed to hazard from occupation)	475	355.07	134
46	Coal mines: working coal miners (bituminous)	45	34.22	132
1	Army-commissioned officers, excluding chaplains, physicians, surgeons and paymasters	324	247.32	131
161	Motormen on street electric lines	28	21.41	131
133	Domestic servants (women)	188	148.18	127
60	Railways: track supervisors and foremen and section foremen	421	333.07	126
154	Livery stables—proprietors	274	216.84	126

The occupations which are conspicuous for their high death-rates are: first, the miners and workers in stone and clay; second, the locomotive firemen; third, the structural iron

workers; and fourth, the locomotive engineers. The occupations connected with the liquor business rank with these groups. The risks connected with mining operations are well known and are so serious as to have a special government bureau devoted to their amelioration. The locomotive firemen may be said to rank next to the mining occupations.

Accidents to Locomotive Firemen.

FATAL ACCIDENTS.

Returns of the Interstate Commerce Commission. The accident reports of the Interstate Commerce Commission contain the most accurate returns of accidents to railway employees. Since the revised form of table was adopted in 1910 the fatal accident rates to employees engaged in the movement of trains has been as follows:

TABLE VII.

FATAL ACCIDENTS TO RAILROAD TRAINMEN* 1911–1913.

Number of Trainmen in Service on June 30, 1911, 1912, and 1913 and Number Employed for one Killed.

(Interstate Commerce Commission Accident Bulletins 40, 44, and 48.)

Year.	Number Employed.	Number Killed.	Number Employed for one Killed.	Deaths per 1,000 Employees.†
1910–1911	235,841	1,218	194	5.16
1911–1912	245,653	1,182	208	4.81
1912–1913	251,111	1,173	231	4.67

* "Trainmen" include enginemen, firemen, motormen, conductors, brakemen, rear flagmen, train baggagemen and train porters on trains.
† Computed.

The returns of the Commission do not give the data for locomotive firemen separately. The preceding table is given to show the high death-rate from accidents of the general class to which the firemen belong.

Accident Rates Compiled by the United States Employers' Liability Commission. The report of the United States Commission on Employers' Liability and Workmen's Compensation contains a study of accidents to railway employees covering the three years, 1908 to 1910; the returns were secured by the voluntary coöperation of the railroads, but include only selected roads where it is probable that the accident rate was lower than the average for the whole country. The following

table shows the results of this study for the two occupations of locomotive firemen and engineers:

TABLE VIII.

FATAL ACCIDENTS TO LOCOMOTIVE FIREMEN AND ENGINEERS, 1908–1910, AS REPORTED BY THE UNITED STATES EMPLOYERS' LIABILITY AND WORKMEN'S COMPENSATION COMMISSION.

(Source: Report of the Employers' Liability and Workmen's Compensation Commission, Vol. 1, pp. 147–148.)

Occupation.	Number of Employees.	Number of Deaths.	Deaths per 1,000 Employees.
Locomotive Firemen.			
Passenger	23,652	97	4.10
Freight	61,601	291	4.72
Yard	27,837	53	1.90
Mixed	4,520	20	4.42
Total	117,610	461	3.92
Locomotive Engineers.			
Passenger	23,425	130	5.55
Freight	55,717	231	4 15
Yard	25 876	43	1.66
Mixed	4,341	18	4.15
Total	109,359	422	3.86

The greater risk to the firemen is connected with freight traffic while to the engineer the higher risk comes from passenger traffic.

Fatal Accidents in the Brotherhood of Locomotive Firemen. The membership statement of the Brotherhood of Locomotive Firemen and Enginemen does not report the number of firemen, enginemen, hostlers, etc., separately. For the total membership, the number of deaths caused by railroad accidents is as follows:

TABLE IX.

DEATHS OF MEMBERS OF THE BROTHERHOOD OF LOCOMOTIVE FIREMEN AND ENGINEMEN, 1904–1912, BY ACCIDENT AND OTHER CAUSES.

(Source: Eastern Concerted Wage Movement, pp. 276, 279.)

Year.	Number of Members.	Number and Cause of Death.			
		Railroad Accidents.	Diseases.	All Other.	Total.
1904	54,434	236	182	35	453
1905	55,287	260	203	33	496
1906	58,849	234	196	31	461
1907	62,916	287	260	34	581
1908	66,408	195	199	42	436
1909	65,315	182	195	34	411
1910	73,469	263	227	29	519
1911	79,942	214	250	58	522
1912	85,292	253	251	54	558

The Medico-Actuarial Investigation. In the medico-actuarial mortality investigation, the death-rate from accident is mentioned in the introductory text of Volume 3, but no tabulation is given. The text of the report shows that the mortality of locomotive firemen from accident is the highest of all the occupations included in the study, being "nine times the normal" (page 19). The next highest rate given is for locomotive engineers with "eight times the normal." In other occupations with high mortality rates, the accident mortality was distinctly lower than that for locomotive firemen; thus, for underground mining, other than coal mines, the fatal accident rate was "seven time the standard"; for anthracite coal miners six times, and for bituminous coal miners more than five times the standard; for structural iron workers, including house-smiths and bridge builders, the death-rate from accident was six times the normal.

Ratings of the International Association of Accident Underwriters. The attitude of the accident insurance companies towards the occupation of locomotive firemen is significant as showing the estimate of students of occupation risks from a commercial standpoint. Instead of using the estimates of individual companies, a general estimate made by the officials of the leading companies through their organization will be sufficient for present purposes. The International Association of Accident Underwriters has issued a "Classification of Occupations for Accident and Health Insur-

ance" (New York, 1912, The Spectator Company), in which the occupations which are accepted for accident insurance are rated in nine classes, the first class being the least dangerous and the ninth class the most dangerous. It should be stated, however, that class 9 includes only non-insurable risks and that class 8, the "Perilous" class, has practically no risks quoted in it except certain rolling mill employees; in fact, the edition of February 1, 1912, has only one reference to class 8. As a matter of fact, therefore, the standard list contains only seven classes of risks. It is significant that this seventh class, officially designated as "Extra Hazardous," is the one in which locomotive firemen are rated. The standard classifications shows, therefore, that the occupation of locomotive firemen is the most hazardous that the companies will accept for accident insurance; anything more dangerous will not be considered. This estimate of the fireman's risk is expressed concretely by the restriction on the amount of insurance allowed and by the premium rate charged. For safe risks, such as that of a general officer of a railroad, $10,000 is the limit of an accident policy; for a locomotive engineer on a northern road, $2,000 is the limit of policy, while for a fireman on a northern road $1,000 is the highest policy permissible. The standard premium rates for a policy providing $1,000 on death or $5 per week during disability also emphasize the greater hazard of the fireman as contrasted with the engineer, as well as with other occupations. The following is the standard accident policy rate for locomotive firemen and engineers on northern roads:

COST OF AN ACCIDENT INSURANCE POLICY FOR LOCOMOTIVE FIREMEN AND ENGINEERS, AS COMPUTED BY THE INTERNATIONAL ASSOCIATION OF ACCIDENT UNDERWRITERS ON FEBRUARY 1, 1912.

Amount Payable for		Annual Premium for	
Death.	Weekly Indemnity.	Firemen.	Engineers.
$1,000 and	$5	$20	$18.00
1,000 and	10	35	31.50

Briefly stated, the fireman must pay $20 for exactly the same policy which the engineer is given for $18. The important fact, however, is that the fireman's occupation is on the margin of insurability; were the risk much greater, the occupation would probably be classed as non-insurable.

Risk of Bodily Injury.

Rate of Injury. It is the experience of the German workman's insurance system that the great number of physical injuries which disable men temporarily cause more economic loss to the group of employees than the deaths. In the case of locomotive firemen, the muscular strain of his occupation, combined with the conditions under which he performs his work, makes this occupation unusually prolific of injuries to various parts of the body. The general group of train employees has the following rate for physical injuries:

TABLE X.

INJURIES TO RAILROAD TRAINMEN,* NUMBER OF TRAINMEN IN SERVICE ON JUNE 30, 1911-1913, AND THE NUMBER EMPLOYED FOR ONE INJURED.

(I. C. C. Accident Bulletins 40, 44, and 48.)

Year.	Number Employed.	Number Injured.	Number Employed for One Injured.	Injuries per 1,000 Employees.†
1910-11	235,841	29,306	8.0	124.3
1911-12	245,653	30,592	8.0	124.5
1912-13	251,111	34,183	7.3	136.1

* "Trainmen" include enginemen, firemen, motormen, conductors, brakemen, rear flagmen, train baggagemen and train porters on trains.
† Computed.

That the risk of injury to which train employees are subjected is extremely high is obvious from the above rate. No separate figures for firemen are given.

The most recent study of bodily injury of railway employees is that of the United States Workmen's Compensation Commission which covered the three years 1908, 1909, and 1910. The information represents the experience of companies operating approximately one half of the total railway mileage of the United States and employing nearly 57 per cent. of all railway employees, excluding officers. The following table shows the data for locomotive firemen and engineers:

TABLE XI.

NUMBER OF INJURIES TO LOCOMOTIVE FIREMEN AND ENGINEERS, 1908–1910.

Source: Report of United States Employers' Liability and Workmen's Compensation Commission, Vol. 1, p. 148.)

Occupation.	Number of Employees.	Permanent Total Disability.	Permanent Partial Disability.	Temporary Disability (Over 2 Weeks).
Locomotive Firemen.				
Passenger	23,652	2	30	1,183
Freight	61,601	12	126	4,582
Yard	27,837	4	30	926
Mixed	4,520	1	7	152
Total	117,610	19	193	6,843
Locomotive Engineers.				
Passenger	23,425	6	24	807
Freight	55,717	10	62	2,664
Yard	25,876	5	32	717
Mixed	4,341	—	3	95
Total	109,359	21	121	4,283

TABLE XII.

RATE OF INJURY TO LOCOMOTIVE FIREMEN AND ENGINEERS, 1908–1910.

Occupation.	Number of Employees.	Rate per 1,000 Employees.		
		Permanent Total Disability.	Permanent Partial Disability.	Temporary Disability (Over 2 Weeks).
Locomotive Firemen.				
Passenger	23,652	.08	1.27	50.02
Freight	61,601	.19	2.05	74.35
Yard	27,837	.14	1.08	33.27
Mixed	4,520	.22	1.55	33.63
Total	117,610	.16	1.64	58.18
Locomotive Engineers.				
Passenger	23,425	.26	1.02	34.45
Freight	55,717	.18	1.11	47.81
Yard	25,876	.19	1.24	27.71
Mixed	4,341	—	.69	21.88
Total	109,359	.19	1.11	39.16

The preceding tables show that there is little difference between the firemen and engineers as regards total permanent disablements, but that these cases are relatively few in number. The cases of permanent partial disablement show that the fireman is injured about 50 per cent. more often than the engineer. The cases of temporary disablement also show that the fireman's risk is about 50 per cent. greater than that of the engineer.

Nature of Injuries Sustained. Among railway employees one of the most frequent and serious causes of injury and loss of time is the spraining of joints and muscles. A special study on this subject by Doctor Sneve, Chief Surgeon of the Chicago Great Western Railway, explains that of the accidents reported on this road, sprains and strains of joints and muscles made up 14.45 per cent. of the total. Doctor Sneve says (p. 47) "six years of experience in railroad work leads me to believe that these are precisely the injuries which lay up the employees the greatest length of time."

Doctor Sneve then gives statistics of these injuries reported on his road in the year 1899:*

* American Academy of Railway Surgeons, 1900, pp. 45–46.

TABLE XIII.

SPRAINS AND STRAINS TO MUSCLES AND JOINTS OF EMPLOYEES OF CHICAGO, GREAT WESTERN RAILROAD, 1899.

Character of Injury.	Number.	Cause of Injury.	Number.
Firemen.			
Thumb	2	Falling down	17
Wrist	4	Shaking grates	3
Lumbar	5	Collision	1
Shoulder	4	Muscular exertion	3
Foot and ankle	2	.....	.....
Knee	2	.....	.....
Hip and thigh	3	.....	.....
Forearm	1	.....	.....
Side	1	.....	.....
Total	24		24
Brakemen.			
Shoulder	3	Arm twisted	1
Knee	2	Muscular exertion	1
Arm	1	Falling	7
Elbow	1	Turning foot	2
Foot and ankle	5	Lifting	2
Lumbar	2	Collision	1
Total	14		14
Engineers.			
Lumbar	5	Switching	1
Wrists	2	Wreck	1
Leg	1	Falls	5
Elbow	1	Arm caught	1
Thumb	1	Collision	1
		Tank tipped	1
Total	10		10
Section Hands.			
Inguinal region	1	Struck stove	1
Foot and ankle	2	Falls	4
Abdominal muscles	1	Collision	2
Wrists	3	Turned foot	1
Knee	1	Lifting	2
Neck	2	.....	.....
Total	10		10
Miscellaneous.			
Knee	2	Falls	18
Wrist	6	Muscular exertion	2
Side	2	Scuffling	1
Ankle and foot	13	Caught foot	4
Lumbar	6	Lifting	2
Leg	2	Turning foot	5
Finger	1	.....	.....
Total	32		32

Doctor Sneve's comment on this table is as follows:

"It will be seen from the table that, as far as occupation is concerned, the greatest number injured, strangely enough, were fireman . . . ."

"We would have expected *a priori* that the number of sprains would have been greatest in the brakemen, who are continually climbing over cars and running backward and forward along the train, but the number of those so injured was only 14. Next were engineers and section hands, . . . and finally all other occupations."

"It appears that engineers hurt their backs, brakemen their ankles, while the firemen sprain backs, wrists, and shoulders indifferently."

To sum up this statement, the testimony of an experienced chief railway surgeon is to the effect that, of the injuries which he believes disable railroad men the greatest length of time, locomotive firemen are injured more than the other railroad employees, and that the nature of their occupation exposes practically all parts of the body to such injury.

Firemen's Injuries Reported in Illinois. The 1910 law of the State of Illinois requires the employer to report to the State bureau of labor all cases of accidents causing disability for more than 30 days. The following table is a list of such injuries which were reported for locomotive firemen to the State bureau during the year 1911:

TABLE XIV.

NON-FATAL ACCIDENTS TO LOCOMOTIVE FIREMEN ON STEAM RAILROADS IN ILLINOIS, 1911.

Name of Railroad.	Date of injury.	Character and Cause of Injury.	Duration of Disability (Days).
C. and A.	Mar. 28	Foot amputated—run over by car	*
C. B. & Q.	Feb. 24	Wrist broken—fell into pit	42
C. B. & Q.	Feb. 26	Arm broken—fell over hydrant	120
C. B. & Q.	May 6	Arm broken—fell from engine	90
C. B. & Q.	May 15	Head injured—engine derailed	61
C. B. & Q.	June 9	Ankle injured—falling iron	42
C. B. & Q.	June 21	Back injured—collision	40
C. B. & Q.	Sept. 19	Arm broken—fell off engine	33
C. B. & Q.	Oct. 17	Arm broken—engine and car	51
C. B. & Q.	Nov. 13	Arm broken—caught in engine wheel	74
C. & E. Ill.	Feb. 9	Finger injured—shaker bar and can rack	37
C. & E. Ill.	May 12	Body burned—gas explosion	46
C. & E. Ill.	May 27	Leg injured—fell from stool	31
C. & E. Ill.	July 21	Body injured—getting off engine	35
C. & E. Ill.	Oct. 11	Head injured—struck by car	30
C. & E. Ill.	Nov. 15	Leg injured—fell into pit	33
C. & E. Ill.	Nov. 17	Leg burned—hot water	64
C. G. W.	Feb. 2	Head injured—fell off engine	30
C. G. W.	May 22	Wrist broken—fell off engine	90
Ch. Jct.	Aug. 4	Eye destroyed—struck by crane lever	38
Ch. Jct.	Aug. 22	Collar bone broken—fell from engine	50
C. & N. W.	Jan. 19	Arm broken—flying iron	90
C. & N. W.	May 3	Leg injured—struck tank	70
C. R. I. & P.	Apr. 8	Ankle sprained—getting off engine	47
C. R. I. & P.	June 6	Leg amputated—run over by train	150
C. R. I. & P.	Oct. 1	Ankles sprained—fell on coal	120
C. R. I. & P.	Dec. 15	Ribs broken—fell into pit	31
E. J. & E.	June 9	Knee injured—jumped from engine	75
Ill. Cent.	Feb. 10	Foot broken—jumped from engine	120
Ill. Cent.	Feb. 10	Head injured—engine and car	90
Ill. Cent.	Mar. 16	Hand injured—lever and box	32
Ill. Cent.	May 5	Nose broken—jumped from engine	60
Ill. Cent.	May 8	Ribs broken—fell against door opener	36
Ill. Cent.	May 10	Leg broken—fell from engine	90
Ill. Cent.	May 21	Rib broken—falling bar	45
Ill. Cent.	June 1	Ankle sprained—jumped from engine	49
Ill. Cent.	June 15	Back injured—fell from engine	30
Ill. Cent.	July 22	Finger mashed—car and barrel	42
Ill. Cent.	Oct. 13	Back injured—fell on engine deck	31
Ill. Cent.	Oct. 18	Head injured—engine and car	30
Ill. Cent.	Nov. 4	Head cut—engine and car	31
Ill. Cent.	Nov. 16	Head injured—engine and signal staff	44
Ill. Cent.	Nov. 29	Leg broken—fell from engine	†
Ill. Cent.	Dec. 28	Collar bone broken—car and engine	102
L. S. & M. S.	Jan. 23	Body injured—fell from car	36
M. and C.	Apr. 2	Foot injured—falling coal	32
M. and C.	Aug. 10	Arm broken—fell from engine	42
M. and C.	Dec. 13	Back injured—falling coal	33
St. L. I. N. & S.	Feb. 20	Ankle broken—collision	180
St. L. I. N. & S.	June 8	Leg burned—hot water	55
St. L. I. N. & S.	Nov. 28	Shoulder injured—fell from tank	36
St. L. Br. Term'l	Dec. 3	Collar bone broken—fell from engine	60
St. L. Troy & E.	Sept. 25	Leg amputated—run over by car	*
S. R. Co.	June 17	Body injured—engine derailed	35
T. P. & W.	Apr. 8	Body injured—collision	36
Vandalia	Apr. 9	Eye injured—flying coal	34

* Permanent. † Over 30 days.

Because the above table includes only injuries causing disability for more than 30 days, the number included is relatively small. Of the 56 accidents here listed, the number of days

lost is given for 53 cases and amounted to 3,031 days, or an average of 57.4 days per injury. The table indicates the general hazard of the occupation by the uniform manner in which the injuries affected the different parts of the body; head injuries number 10, trunk injuries 16, arm injuries 12, and leg injuries 18. Bone fractures number 23, or 50 per cent. of the total. In most industries, the risk of injuries is usually limited to one part of the body and it is possible to provide safety appliances to prevent accidents. The firemen's occupation, however, exposes his whole body and there seems to be practically no means of protecting him against the inherent hazard of his employment.

Occupational Diseases.

The diseases connected with the occupation of locomotive fireman are of the same kind as occur in other occupations, but affect firemen in a greater degree than other employees because of the conditions connected with the firemen's work. Special classes of diseases peculiar to certain occupations, such as miners' asthma, or metal poisoning (lead, arsenic, etc.), do not occur in the case of firemen.

The experience of the mutual insurance organization of the Brotherhood of Locomotive Firemen and Enginemen is practically the only source of information on this subject available at the present time. A table compiled by this organization gives a comparison of its experience with that of two large fraternal insurance societies; this table is as follows:

TABLE XV.

MORTALITY EXPERIENCE OF BROTHERHOOD OF LOCOMOTIVE FIREMEN, MODERN WOODMEN OF AMERICA, AND WOODMEN OF THE WORLD, SELECTED BY CAUSES.

(Source: Eastern Concerted Wage Movement, p. 332.)

Cause of Death or Disability.	Modern Woodmen of America. Number of Members Exposed to Risk in 27 Years was 10,238,726.			Brotherhood of Locomotive Firemen and Enginemen. Number of Members Exposed to Risk in 31 Years was 1,125,608.			Woodmen of the World. Number of Members Exposed to Risk in 20 Years was 3,803,740.		
	Number of Claims.	Rate per 1,000 Members Exposed.	Per Cent. of Loss.	Number of Claims.	Rate per 1,000 Members Exposed.	Per Cent. of Loss.	Number of Claims.	Rate per 1,000 Members Exposed.	Per Cent. of Loss.
Typhoid fever	4,108	.4012	7.64	735	.653	6.95	2,673	.7024	8.55
Tuberculosis	7,907	.77225	14.71	1,012	.899	9.58	4,277	1.1239	13.69
General disease, inc. cancer	4,680	.4570	8.70	194	.1723	1.83	2,334	.6134	7.79
Heart disease and other circulatory disease	7,162	.6995	13.32	461	.4095	4.36	2,426	.6375	7.76
Bright's disease and other genito-urinary disease	3,405	.33255	6.33	339	.3010	3.20	2,307	.6062	7.38
Other zymotic disease	1,993	.19465	3.71	436	.3873	4.12	1,519	.3992	4.86
Pneumonia	4,912	.4797	9.14	394	.3499	3.73	3,582	.9413	11.43
Other respiratory disease	918	.08965	1.71	53	.0470	.50	620	.1629	1.98
Digestive disease	4,989	.4872	9.28	416	.3694	3.93	2,923	.7681	9.35
Nervous disease	4,177	.40795	7.77	625	.5552	5.91	2,126	.5587	6.80
Violence, including suicide and amputations	8,665	.8463	16.12	5,587	4.9635	52.86	5,101	1.3415	16.32
Blindness	.....	.....	.....	163	.1448	1.54	.....	.....	.....
Unclassified	847	.0827	1.57	153	.1359	1.45	1,258	.3306	4.03
Total	53,763	5.25065	100.00	10,568	9.3878	99.96	31,146	8.1857	99.94

The rates given in the preceding table are suggestive in certain regards. Of the three societies, the Modern Woodmen have the most favorable general rate (5.25 per 1,000 members); the rate for the Woodmen of the World is 8.1857 and for the firemen 9.3878 per 1,000 members. The firemen's rate, however, includes the extremely high rate of 4.9635 for violence, etc. Next to this rate, that for blindness is conspicuous. This high rate is in part caused by exposure to the heat and strong light of the firebox on the locomotive.* It is evident that loss or impairment of eyesight must be considered an occupational disease of firemen. The detailed tables prepared by the firemen's insurance organization show a surprising number of injuries to the eyes from bursting of water glasses or other gauges.

* Eastern Concerted Wage Movement, pp. 289 to 304, 315–320. See also Proceedings before the Board of Arbitration, 1913, pp. 457–513.

The preceding table, unfortunately, provides no information as to the age grouping of the various societies. Undoubtedly the organization of the firemen, with its large proportion of young men, should have a low rate for heart disease and circulatory disease—perhaps even lower than that shown in the table. The rate for nervous diseases is high, though not higher than that of the Woodmen of the World; here again, the influence of the age grouping is probably the decisive factor.

General Conclusions.

There is general agreement that the occupation of locomotive fireman is "extra hazardous."

There is general agreement that the mortality rate of locomotive firemen is higher than that for engineers.

Two special studies of mortality conducted by the Actuarial Society of America show that the occupation of locomotive firemen has a higher death rate than the rate for engineer, express messenger, mail clerk, passenger trainman, passenger conductor, and track supervisor.

As compared with other hazardous occupations, locomotive firemen have a mortality rate which is about the same as that for anthracite miners, but is higher than the rate for potters, for structural iron workers, for locomotive engineers, etc.

Fatal accidents cause about 50 per cent. of the deaths of the members of the firemen's insurance organization. Fatal accidents occur more frequently to firemen than to any other occupation included in the Medico-Actuarial Investigation; they were, for instance, distinctly more frequent than for miners of any kind, or for structural iron workers.

The standard rating of accident insurance companies groups locomotive firemen in the most dangerous class for which they accept insurance.

The risk of temporary disablement and of permanent partial disablement is 50 per cent. higher for firemen than it is for engineers.

The fireman seems to be more exposed to injuries like strains and sprains (which cause greater loss of time than other injuries) than any other group of railway employees.

The fireman's injuries affect all parts of his body and special protection against them seems impossible. Fractured bones are a conspicuous feature of his injuries.

Loss and impairment of eyesight and liability to nervous disease are special hazards of the fireman's occupation.

While part of the fireman's risk is due to the fact that the "new-comer" in any occupation has a high accident rate, the general hazard of the occupation is so great as to be principally responsible for the high rates for death and injury.

LIST OF SOURCES.

Actuarial society of America. Experience of thirty-four life companies upon ninety-eight special classes of risks. Comp. and pub. by the Actuarial society of America. New York, 1903.

American academy of railway surgeons. Report of the . . . annual meeting. Chicago.

Board of arbitration in the controversy between the eastern railroads and the Brotherhood of Locomotive Firemen and Enginemen, 1913. Proceedings. Arbitration between the eastern railroads and the Brotherhood of Locomotive Firemen and Enginemen submitted to arbitration, under the Erdman act, by agreement dated Feb. 18, 1913. At Waldorf Astoria hotel, New York, March 10–April 5, 1913. New York, 1913. In 4 volumes.

Braehmer, O. Eisenbahnhygiene, von Dr. Otto Brämer. 2. Aufl. Unter Mitwirkung der Herren Geheimen Bauräte Bathmann und Bork in Berlin und Schumacher in Potsdam, neu bearb. von Dr. Ernst Schwechten. Mit 28 Tafeln, einer Karte und 81 Abbildungen im Text. Jena, G. Fischer, 1904.

Braun, H. Die Sterblichkeits- und Invaliditäts-verhältnisse des Locomotivpersonals deutscher Eisenbahnen. *In* Zeitschrift f. d. ges. Versicherungs-wissenschaft, 1911, pages 429 ff. and 635 ff.

Brotherhood of Locomotive Firemen and Enginemen. International president. Eastern concerted wage movement, 1912–1913. Supplemental report of the International president, Brotherhood of Locomotive Firemen and Enginemen, for the three months ending March 31, 1913. n. p. 1913.

Classification of occupations for accident and health insurance. As approved by International association of accident underwriters. Rev. and cor. to February 1, 1912. New York. 1912.

Crum, F. S. Accidents to railroad employees in New Jersey, 1888 to 1907. *In* Bulletin of U. S. Bureau of Labor, No. 84.

Hayes, D. A. Length of the trade life in the glass bottle industry. *In* Annals of the American Academy of Political and Social Science, May, 1906.

Hoffman, F. L. Industrial accidents and trade diseases in the United States. *In* Transactions of the fifteenth International Congress on Hygiene and Demography, vol. 1, pp. 763 ff.

Hoffman, F. L. Physical and Medical Aspects of Labor and Industry. *In* Annals of the American Academy of Political and Social Science, May, 1906.

Hunter, A. Mortality among Insured Lives engaged in certain Occupations involving additional hazard, such as liquor dealers, railroad men, miners, policemen and electricians. *In* Transactions of the Actuarial society of America, May, 1907 (vol. X, no. 37).

Medico-actuarial mortality investigation. Comp. and pub. by the Association of life insurance medical directors and the Actuarial society of America. New York, 1912–13. In 4 volumes.

Volume III is entitled "Effect of Occupation on Mortality."

New York Life Insurance Co. Treatment of applicants engaged in occupations which involve some additional hazard. Form 1519. May, 1912 (pamphlet, 12 pp.).

O'Connell, J. The Manhood tribute to the modern machine: influences determining the length of the trade life among machinists. *In* Annals of the American Academy of Political and Social Science, May, 1906.

Oliver, Sir. Thomas. Dangerous trades: the historical, social, and legal aspects of industrial occupations as affecting health, by a number of experts; ed. by Thomas Oliver. London, J. Murray, 1902.

Overlock, M. G. The working people: their health and how to protect it, by M. G. Overlock. Worcester, Mass., The Blanchard press, 1910.

Prinzing, F. Handbuch der medizinischen Statistik. Von dr. med. Friedrich Prinzing. Jena, G. Fischer, 1906.

Prudential insurance company of America, Newark, N. J. Exhibits of the Prudential insurance company of America, International congress on hygiene and demography, Washington, D. C., September, nineteen twelve. Newark, Prudential press, 1912.

General mortality data of particular occupations.

Risser —. Etablissement d'une table provisoire de mortalité des ouvriers mineurs dans les mines de combustibles minéraux et dans les antres mines (France). *In* Bulletin trimestriel de 'l'Institut des Actuaires Français, No. 95.

U. S. Bureau of the Census. Thirteenth Census, 1910. Population, vol. IV, Occupation Statistics.

U. S. Bureau of the Census. Mortality statistics, 1909. Tenth annual report with revised rates for the intercensal years 1901 to 1909, based upon the census of 1910. Washington, 1912.

U. S. Bureau of labor. Workmen's insurance and benefit funds in the United States. Washington, Govt. print. off., 1909. (Annual report of the commissioner of labor, 23d, 1908.)

Issued also in the Congressional series, no. 5494, as House doc. 1565, 60th Cong., 2d sess.

U. S. Employers' liability and workmen's compensation commission. Message of the President of the U. S. transmitting the report of the Employers' liability and workmen's compensation commission,—together with the hearings held before the commission. Washington, Govt. print. off., 1912.

Westergaard, H. Die Lehre von der Mortalität und Morbilität. Anthropologisch-statistische Untersuchungen, von Harald Westergaard. 2. vollständig umgearb. Aufl. Jena, G. Fischer, 1901.

Zeitschrift für die gesamte Versicherungs-wissenschaft; hrsg. vom Deutschen Verein für Versicherungs-wissenschaft. Berlin, E. S. Mittler und Sohn.

VITAL STATISTICS—THE WHITE SLAVE OF SANITATION.*

By CRESSY L. WILBUR, M.D., *Director of Vital Statistics, New York State Department of Health, Albany.*†

Vital statistics are almost universally recognized by practical sanitarians to be the absolutely necessary bases of all progressive, modern public health work. What we call State Medicine undoubtedly owes its origin to the systematic collection and study of the vital facts of human life first carried out in the splendid series of English reports of the Registrar-General begun by Dr. William Farr nearly eighty years ago (1837). Today it should scarcely require explanation or argument, especially before an audience of medical men—and women—to show that the city, state, or country that continues to dwell in ignorance of its exact sanitary condition, as shown by absolutely reliable vital statistics, is an anachronism, a relic of the dark ages, fitter for association with those who still believe in witchcraft and amulets than with the scientific sanitarians of the present day.

It is unnecessary, but I love to quote the emphatic declaration of Doctor Fulton, Secretary-General of the International Congress on Tuberculosis and of the International Congress of Hygiene and Demography, the accomplished and experienced executive officer of the Maryland State Board of Health—a state, by the way, which in common with New York is now putting into effect a system of district sanitary supervisors or health officers, the results of which will undoubtedly be of much interest in connection with a similar plan of sanitary organization proposed for Michigan. Doctor Fulton said:

"Public hygiene is built upon, is controlled and directed by, and is everlastingly in debt to vital statistics. The might and the right to direct the future of preventive medicine, to make and to terminate contracts, to approve and reject risks, to test materials and methods, to invest means and distribute

* Paper read before the Michigan State Medical Society, Lansing, September 10, 1914.

† Chief Statistician for Vital Statistics, 1906–14, U. S. Bureau of the Census, Department of Commerce.

profits, these things belong inalienably to vital statistics. Every wheel that turns in the service of public health must be belted to this shaft, otherwise preventive medicine must remain invertebrate and unable to realize the profits available from the magnificent offerings of collateral sciences. If the unborn historian of hygiene in the twentieth century shall find one anomaly more curious than any other, it will be that the twentieth century, opening with prodigious resources, immediately available, ran a third or half its course before these resources became so standardized that each unit of power might be accounted for in a definite scheme of vital statistics."

Today every public health official, every enlightened physician, every earnest social worker demands the aid of accurate vital statistics. The great life insurance companies are in the field for longer and better human life—not from selfish motives of saving dollars and cents through the prolongation of the lives and usefulness of their policyholders, but, as I believe, through the purest altruistic motives. As a sample of the splendid work performed by the statisticians and medical officers of prominent life insurance companies, Hoffman, Rittenhouse, Marsh, and many others, I may quote from a leaflet recently gotten out by Dr. Louis I. Dublin, Statistician of the Metropolitan, under the title, "Why States Should Support Vital Statistics."

Doctor Dublin says; "Vital statistics is a system of accounting for human life. Just as the business man gets accurate information for the proper management of his affairs, so the State should secure knowledge of the nature and extent of its vital resources. Without vital statistics, the State cannot know how best to safeguard the health and prosperity of its citizenship. Births, marriages and divorces, and cases of sickness and death are facts with which the modern State is most concerned. They correspond to the income and disbursements of the business man. A balance sheet properly kept—[note the words "properly kept"]—by the State shows whether or not progress is being made. . . . Statistics of sickness and death are among the community's chief means of preventing suffering and saving life. The health officer

must know where cases of contagious diseases are found; for only in this way can he check epidemics and protect the people. Death certificates tell the modern health officer just what are the chief weaknesses in his sanitary arrangements. Too many cases of typhoid fever point to a bad water supply, to an inadequate sewerage system, or to polluted milk. A large number of deaths from tuberculosis points out a distinct health policy to the community and tells definitely whether the facilities at hand are sufficient to cope with the situation. Today, no community can properly safeguard the health of its people if it has not at hand accurate and complete statistics of sickness and death."

"Accurate and complete statistics of sickness and death!" Have you accurate and complete statistics of sickness in Michigan? Are even your statistics of deaths—and of births also, because the exceedingly important ratio of infantile mortality depends upon complete registration of all births that occur—accurate and complete as they should be for the protection of the interests of all citizens of the state, and especially of the children born therein? Your answer must be No; and yet Michigan is far in advance of many states of the Union with respect to the registration of vital statistics, and was, at one time, thanks to that grand pioneer sanitarian whom, to the eternal disgrace of the state, Michigan has neglected to honor as he has well deserved, a leader not only in the United States but in the world in this most fundamental matter of statistics of sickness. I refer to Dr. Henry B. Baker, for many years Secretary of the Michigan State Board of Health. He put Michigan on the map in a sanitary sense, when doctors were quarrelling as to whether scarlet fever and diphtheria were infectious, and later arguing in a similar way about tuberculosis. "A prophet is not without honor save in his own country." Here is what Assistant Surgeon-General John W. Trask, United States Public Health Service, in his recently published monograph, "Vital Statistics—A Discussion of What They Are and Their Use in Public Health Administration," says of Doctor Baker's epoch-making work:

"Massachusetts and Michigan were pioneers in the collection of information regarding the prevalence of disease. . . .

"Early development in Michigan. The plan which the Massachusetts State Board of Health adopted in 1874 of furnishing postal-card blanks to voluntary correspondents for the purpose of collecting weekly information of the prevalence of disease was adopted by the Michigan State Board of Health in 1876. In its annual report for the year the State Board of Health in referring to the matter states, 'A knowledge of the nature and extent of prevalence of at least the several prominent diseases throughout the State has from the first organization of the board been considered desirable.'"

* * * * *

"The Michigan law seems to be the first one looking to the comprehensive collection of information in regard to the prevalence of disease, and for a number of years the work was carried on with intelligence and perseverance under the able supervision of Dr. Henry B. Baker, Secretary of the State Board of Health. Doctor Baker was truly a pioneer in this work and many years ahead of his time in his appreciation of its importance."

I believe that you will all concur with me in this magnificent tribute, from the head of the Government work in morbidity statistics, to Dr. Henry B. Baker, a citizen of Michigan. Ousted from the important office of executive health officer of Mighican by the agency of cheap and nasty political "workers" —I will not disgrace the name of "politician," which may be used in an honorable sense, by applying it to such Grylles, to whom the valuable reports and collections of sanitary and statistical documents made through many years by Doctor Baker were indeed "pearls"—they went to the junk-dealer or the bonfire—the record of Michigan, my native State, and whose honor is indeed dear to me, in the treatment of its pioneer sanitarian, is, and will be forever, a disgrace to the people of the State of Michigan, and to its medical profession—if they only realized, and thoroughly comprehended, what a grievous thing they have permitted to be done.

I have spoken with some feeling in this matter for I owe personally a very large debt to Doctor Baker. When I assumed the direction of the Michigan vital statistics back in '93 at a time when they were merely a laughing-stock for incom-

pleteness and general worthlessness, it was Doctor Baker to whom I turned for advice and helpful counsel in every emergency. You may recall, perhaps, at least some of the older members of this Society may recall, the first paper that I ever prepared for an audience on vital statistics, which was presented at the annual meeting of the Michigan State Medical Society at Grand Rapids in 1894, and discussed by Doctor Baker. From that date, with the help of Doctor Baker, Dr. George E. Ranney of Lansing, Dr. Leartus Connor of Detroit, Dr. Eugene Boise of Grand Rapids, Dr. A. W. Alvord of Battle Creek, and other members of this Society, began the movement which resulted in the passage of a modern vital statistics law for Michigan, a law which, in all essential details, was identical with what is now known as the "Model Law," recommended by the American Public Health Association, the American Medical Association, the Bureau of the Census, and now in practical and successful operation in a score of states—among which, I am glad to say, since January 1, 1914, may be numbered New York. And the Michigan law, in turn, was based largely upon the work of Dr. Elisha Harris of New York; so the circle returns.

I said that all modern public-health workers were convinced of the importance of accurate vital statistics as a basis for their efforts. Unfortunately, this statement is not quite true, at least for the United States. This country is far in the rear of other civilized nations with respect to vital statistics, due to the fact that each of the forty-eight sovereign states must legislate for itself. In going about the country during the past dozen years for the purpose of promoting the passage and enforcement of good registration laws, I have come upon some curious experiences. I am glad to say that the value of vital statistics is almost everywhere recognized; the growth of the registration area from about two fifths of the total population in 1900 to nearly two thirds in 1913 is evidence of this fact. Most of all, during very recent years, is the enthusiastic growth of registration territory in the South, an important portion of the country which, prior to 1911 when Kentucky was admitted, had no registration state. Now good laws are in effect in Virginia, North Carolina, Tennessee, Arkansas,

Mississippi, Louisiana, besides a bill passed by both branches of the South Carolina Legislature and still awaiting approval*—or rejection—by Governor Blease. Every state in the Union at the present time has some form of state law for this purpose, not always a good law but at least some legal recognition of the importance of vital statistics to the community, with one exception. That is the State of Georgia, and I hope that before this paper is presented, the earnest efforts of many citizens of that State and the able editorials and articles on the subject in a large proportion of the state press will be rewarded by the passage of a good law.

Curiously enough, Georgia, the most backward of all American states up to the present time with respect to the keeping of records of the births and deaths of its people, presents the only state sanitary organization that I have ever heard of to go on record as disparaging the practical value of vital statistics for sanitary work. The condition is so unique, and so amusing in these days of sanitary progress, that I may quote briefly from a long letter officially signed by Emory R. Park, M.D., Director Publicity Department of the Georgia State Board of Health, as printed in the *Atlanta Journal*, June 10, 1914, and also from a scathing editorial in the same issue by Mr. James R. Gray, under the caption "Remarkable!" from which it appears how far lay public sentiment may be in advance of benighted and fossilized so-called "professional" opinion.

Here are some gems from Doctor Park's contribution to sanitary and statistical science:

"We beg to state that in our opinion there is no more striking example of the fallacy of figures than in the collection of vital statistics. . . . we think it is of a great deal more importance to the health and treasury of Georgia for the commonwealth to provide county boards of health, county health officers, and money sufficient to enforce our health laws, than it would be for the state to spend several thousands of dollars annually in collecting mere figures which tend to show how many died of this and how many of that disease."

"While we do believe that vital statistics are of some value to public health officials in fighting disease, we most positively

* Approved September 1, 1914.

do not think that vital statistics are essential. While it would be convenient in some respects to be able to know that here so many died of this and there so many of that disease during such and such a period, still this luxury can be, at least for the present, dispensed with. We all know that preventable disease stalks in our midst constantly [possibly it would not "stalk" so constantly in your "midst" if you had a little precise information about its occurrence], and it is no more essential for the medical profession to know just how many died of such and such a cause in order to give the profession a correct point to work from in a campaign against disease than it is essential for lawyers and sheriffs to know just how many people were murdered last year to enable them to start or continue a campaign this year against crime." [!]

Referring to Cabot's and Oertel's misunderstood criticisms of diagnoses of causes of death, which, so far as they are well-founded, apply with even greater force to those daily diagnoses employed by the physician for the treatment of disease, he says:

"Taking our population as a basis, one could easily [note the foolish word], from statistics gathered in other parts of the country [Georgia, a mere parasitic State, sucking nutriment from more progressive communities; the whole is a sad advertisement of health conditions in Georgia and a terrible arraignment of ignorant and incapable health direction]—since the proportion of error is quite as great as it would be here, and probably following the same general lines—in a few hours give to Georgia statistics that would be in every way as reliable as those that could be collected under present conditions."

In which last remark I most cordially agree with Doctor Park, it being understood that the "present conditions" refers to collection by the state health authorities, concerning whom Doctor Park explicitly stated that the letter was prepared by "our desire to give to the people of Georgia the benefit of their board of health's opinion on this subject, the importance of which is often inadvertently overrated."

Says Mr. Gray, in editorial comment:

"Angels and ministers of grace defend us! Do business corporations regard book-keeping as a luxury? Shall the State

regard life-and-death book-keeping as a luxury? Is it merely a 'convenience' to know the extent and the area of particular diseases, to know whether they are diminishing or increasing, to know just where and how to direct health campaigns for the accomplishment of definite and enduring results?

* * * * *

"It is due our State Board of Health, as well as the rank and file of our people, that the Legislature establish a vital statistics bureau for Georgia. If it be audacious to insist upon this point, in the teeth of the highly original communication we publish elsewhere, we can only fall back upon the opinion of the State Medical Association, of national health authorities, of the national census bureau, and upon the example of forty-seven States who, in this respect, have left Georgia 'in the dark backward and abysm of time."*

So much for Georgia! But before you laugh, or at least before you laugh too consumedly, do you remember when physicians in Michigan were protesting against reporting scarlet fever and diphtheria? And bullyragging Doctor Baker and the State Board of Health because "consumption" had been made a reportable disease? Considerable water has gone under the mill since that time, but are you, as physicians, promptly reporting your cases of communicable diseases today, as required by law? Do you report all births within the limit set by law? And do you, as members of County Societies and of the great State organization, uphold the hands of the administrative officers of public health and vital statistics and demand that those laws be enforced, to the letter, with punishment of the negligent and lazy, even though they be your professional brethren in high standing, for the benefit of the people of the state?

It is not yet time to smile at other states!

While I think he is exceedingly misguided and uninformed, I admire Doctor Park's outspoken statement of his position and that of the Georgia State Board of Health, and greatly prefer it to the hypocrisy that talks long and, apparently, with earnestness of the "value of vital statistics," then nullifies or prevents all successful work in that direction for the

*A vital statistics bill was passed by the Georgia legislature August 7, 1914.

sake of personal or professional "graft." Or that, recognizing the need of accurate vital statistics in the state, permits political grafters to make patronage out of registration laws and to barter their enforcement for party or personal help.

Vital statistics has been more prostituted to base political ends than any other branch of public health work. This is why I chose the title for this paper—"Vital Statistics—the White Slave of Sanitation"—because the "rotten vital statistics" with which this country is afflicted are largely due to the lack of protection and encouragement for trained statistical workers, and security of tenure against the personal and political attacks often made as a result of conscientious enforcement of law. The medical profession is too often careless, perhaps deceived by some influential physician who assumes the right to violate the law at his will, and health officers and registrars are afraid, with reason, to do their manifest duty.

Whoever tampers with public health—and vital statistics, except perhaps in Georgia, is the absolutely necessary basis of public health—is a criminal. Doctor Vaughan has said, I believe, that when a death from typhoid fever occurs somebody ought to be considered a murderer and punished accordingly. Certainly, in my judgment, the members of a City Council who, knowingly and for their personal profit, delay the installation of a proper system of water supply, thereby causing needless deaths, are guilty of murder and should be treated with far greater severity than the criminal who slays in a moment of passion. And a great state medical organization, prating for years of the importance of vital statistics and knowing absolutely, as no competent sanitarian doubts for a moment, that reliable vital statistics means the saving of lives—what shall we think of medical men who defer, even for a month or a year, the effective registration of vital statistics in order to protect their semi-political organization and escape the mortification of renouncing the ineffective agencies with which they have gold-bricked their own state? Is true state love and patriotism dead that men care more for power and self-aggrandizing machinery than for human lives—at least their neighbors' children—that might be saved by using the results of effective registration of vital statistics? Give

me Doctor Park, in preference to such traitors to their state and to their profession, every time!

We are cultivating a keener sense for, and a sharper distaste of, graft with the passing of every year. Conditions that existed even a decade ago are unthinkable now. The public conscience is awakening, if not yet fully awake. Why here in this Capitol building, ten years ago, I well recall the scorn with which a member of the Legislature resented the imputation that the possession of railway passes might influence his vote, or at least his attitude, toward railway measures. And this year in Congress the 20-cent mileage (feature of the appropriation bill) was almost done away with. Graft may be defined as the obtaining of money, or other reward, for services not performed. It includes the farming-out of state employment, which should be strictly under a thoroughly enforced and protected civil service, to further the political or personal ends of individuals. It creeps in in unexpected places, in city, state, even in Federal government affairs. Why, do you know that this year, Anno Domini 1914, on the twentieth of July, the registration area of the United States—an area which it has taken many years of devoted work and hearty coöperation on the part of the Federal and State authorities to build up, was practically absolutely destroyed? I do not suppose that a single member of Congress knew of the gravity of the situation. Indeed, I do not know that since the foundation of the Government even one member of Congress has given a single moment of his time to the constructive consideration of the great problem, underlying all our efforts for efficient public-health work on a national scale in this country, of how shall the United States obtain effective registration of vital statistics for the country as a whole. Few indeed have given even the most casual consideration, and even the measures recommended by the American Medical Association were most defective in this important respect. While I believe that the problem will be solved, and that—as most particularly, in some very important respects, a problem of State Medicine—it will be solved by the National Department of Public Health which is sure, some day, to be established, while the present ignorance and indifference of the medical profes-

sion to this fundamental matter of thorough enforcement of registration laws continue, the experiment would be very dangerous. Vital statistics must be protected from graft, and the meanest kind of graft is the peddling of cheap appointments and the displacement of trained and conscientious workers in this field.

Graft is the payment for services not rendered. When the Michigan State Medical Society went before the Legislature in 1895 and 1897, through its committees, they took pains to declare that the proposed law was not for the special benefit of the doctors of the State; nay more, that it imposed certain duties upon physicians without giving them special compensation therefor. Experience has demonstrated that such compensation does not procure complete registration. But after the law was passed, committees of certain county societies procured an amendment giving physicians and midwives fifty cents for each birth. It did not improve the completeness of the returns to any extent if at all. While the individual physician may with propriety receive any fee granted him by state law, how does the organized profession stand with respect to the compensation paid for complete returns and the value therefor not delivered? Does it come under the definition of graft, and would it be well to appoint a committee to consider the propriety of using the whole force of this Society, State and County organizations alike, to "deliver the goods," or else cut out the belittling fee and support the authorities in the thorough enforcement of law, by means of the penalties thereof when found necessary?

Just as I left Albany I had the pleasure of receiving a copy of the splendid address of your President, Doctor Kiefer, and as I write I have just enjoyed the privilege of reading the remarks of Doctor Sawyer. The earnestness of these addresses, which I may take as representative of the active spirit of sanitary advancement now animating the Michigan State Medical Society, demands that I should render to you, as a loyal member of this Society and a citizen of Michigan—until the establishment of my residence in New York—the best information and judgment of which I am capable relative to the condition and conduct of the work in vital statistics in Michigan, my

native State, whose registration service I had the honor to establish and conduct for thirteen years prior to my service as Chief Statistician of the United States Census Bureau, which terminated on July 31, 1914.

Vital statistics in Michigan, as elsewhere, is an essential part of the public health administration. It can not be satisfactorily and successfully conducted except under medical direction as a part of the public health department of the State. All states in which this work has been separated from the public health service have seen their vital statistics undergo a species of dry-rot, in which the important duties of registration and use of vital statistics have degenerated into a mere perfunctory clerical or political administration. Michigan has taken no part in recent years in the national advancement of vital statistics, and has failed to realize the benefits that would have been readily available as a result of the excellent Michigan law. The service has been prostituted to the dirty expedients of political requirements, and the wages of faithful workers have been diverted to the support of political parasites.

The remedy for this condition is reorganization, on a civil service basis if possible, but most emphatically with the absolute elimination of political favoritism and of those who have prostituted the public service for private ends; the establishment of the vital statistics work as an essential, fundamental, honored, and adequately equipped branch of the state health department; and I believe also most earnestly, from my experience in the administration of the New York law, with the organic coöperation of the district supervisors to be provided under a general public health law of the type of the Amberson bill. Under such conditions the sanitary and registration work of the State would again come rapidly to the front, and the rich dividends of human lives saved from disease and death would make us wonder why this step had been so long delayed.

THE DECADENCE OF THE NATIVE AMERICAN STOCK. A STATISTICAL STUDY OF GENEALOGICAL RECORDS.

By Frederick S. Crum.

In 1905, Mr. Frank N. Hagar wrote a book entitled "The American Family," and in his search for the bond of family unity—the tie which binds human couples together when all or most other bonds are withdrawn—he found it in the child.

> Couples alone with this tie need all the possible stimulating of otherwise conjugal love, the obligations, the imprecations of conscience and of society—perhaps the fear of the law, to hold them firm . . . where children are feared, eschewed, or avoided, the deadly seeds of family discord are ever ready to spring up, take root and cause the decay of family unity. When among any people a general practice of child prevention becomes prevalent, that deadly ax has cut the very taproot of the family, of its unity, its life, its persistence, and with it the life and persistence of that people and its institutions.

Again, in an earlier chapter entitled "Decadence of Northern Yankees," Mr. Hagar stated as follows:

> There seems to be one central cause that strikes at the family that is nurtured here, and which the foreigner reared abroad has escaped:—it is a theory that ignores reproduction, that violates the principles of love and domestic association, and that began more obviously in fearing childhood and avoiding parenthood.

As early as 1897 I became interested in the problem with which this nation is confronted in the appalling decrease in the birth-rate of its native stock—the descendants of the founders and builders of this great Republic. An investigation made at that time into the birth-rate of Massachusetts during the period 1850 to 1890 revealed only too clearly the decline in the birth-rate of that commonwealth, and the phenomenon was particularly noticeable in the native element of the population. That investigation only confirmed the results of previous inquiries and notably that instituted in the Massachusetts State Census of 1885 whereby it was shown that 20.2 per cent. of the native married women were without

children as against 13.3 per cent. of the married women of foreign birth. Again, that census of 1885 showed the average number of children living per each native married woman to have been 1.92, against 3.01 for the married women of foreign birth.

Other careful investigators of the subject, including R. R. Kuczynski* in 1901 and 1902, Allyn A. Young† in 1905, and Frederick L. Hoffman‡ in 1909, all interpret the best available data in the same way and all arrive at the same general conclusion, namely, that the native element is failing to contribute anything like its proper quota to the new population of this country.

Not satisfied with the limited data of determining value available in the census and registration reports, I have made a statistical analysis of twenty-two genealogical records of pioneer families which originally settled in New England or the middle Atlantic states. The results of this inquiry confirm all the direst forebodings of those who have preached most strenuously against race suicide. The results briefly set forth in the following table may be considered absolutely reliable and representative of the true state of affairs in the native element of the population north of the Mason and Dixon line.

TABLE I.

AVERAGE NUMBER OF CHILDREN PER WIFE.

(Statistics Based upon Twenty-two Genealogical Records* of American Families.)

Marriage Periods.	Number of Wives.	Number of Children.	Average Number of Children per Wife.
Previous to 1700	276	2,034	7.37
1700–1749	802	5,478	6.83
1750–1799	1,966	12,649	6.43
1800–1849	5,530	27,320	4.94
1850–1869	3,062	10,630	3.47
1870–1879	1,086	3,004	2.77
Totals	12,722	61,115	4.80

* Only carefully edited genealogical records were used.

This table reveals most clearly the decadence of the original stock which with almost boundless energy "cleared the forests,

* The Fecundity of the Native and Foreign-Born Population in Massachusetts. The Quar. Jour. of Economics,, Nov., 1901 and Feb., 1902.

† The Birth-Rate in New Hampshire. Quarterly Publications of the Am. Stat. Assn., Sept., 1905.

‡ The Decline in the Birth-Rate. The North American Review, May, 1909. Maternity Statistics of the State of Rhode Island, State Census of 1905. Proceedings of the First International Eugenics Congress, London, 1912.

gleaned the uneven fields from the glacial stone drift, built in quick time their homely cabins, and moving from tract to tract like a collective array of nature's life, even as the animals and plants, spread with their increasing sons and daughters." Continuing, Mr. Hagar truly says: "They would have laughed to scorn at the modern task of doing so simple a thing as to raise a child. Their women in addition to the work of their large families, and of ordinary housekeeping without modern improvements, performed nearly all the labor that is now done in factories and shops in fitting raw material for use as clothing and food." An average per wife of 7.37 children in the seventeenth century, was 4.60 more than for wives of their descendants married during the ten years, 1870 to 1879! Later data are difficult to secure in sufficient number to be reliable, for at least thirty years must be allowed from the date of the marriage to the closing of the record of the children resulting therefrom.

It goes without saying that a reduction in the average number of children per wife from 7.37 to 2.77 has not been fully offset by reduced infant mortality. There is fragmentary evidence, too, in census returns and other sources, that the present-day average number of children in *completed* American families is considerably less than 2.77 per wife. In fact, it is very doubtful if the present-day average is as high as two children per native American wife. Comment upon this condition of affairs is unnecessary at this time except that it may be stated that the facts available in the most reliable sources seem to indicate that the native American stock has reached the point where it is failing to maintain itself, that is, its births are quite certainly fewer than its deaths at the present time.

If the seventeenth century average had prevailed in the 1,086 families reported for 1870–1879, they would have produced 4,996 more children than were actually recorded. In the eighteenth century, the size of the family was fully sufficient to populate a new country in a normal way. From the beginning of the nineteenth century, however, the decline in the birth-rate of the native stock has been so rapid as to preclude any conclusion other than that it has been deliberate

and largely the result of selfish motives. Such evidence as is available from the most recently compiled genealogies and from such external evidence as must be obvious to all careful observers of present-day conditions, it is quite clear that when sufficient data are available for marriages subsequent to 1880, the average number of children per native wife will be found to have fallen to at most two, and probably less.

Genealogical records, however, do not tell the whole story. There are fewer marriages in proportion to the persons of marriageable age than in the early days and there are more childless wives, some of whom are almost necessarily omitted from statistics based upon genealogical records.

Every careful observer of present-day tendencies has noted and many have commented upon the fact that childless marriages, particularly among Americans of native stock, appear to be, proportionately to the total married women of that stock, rapidly increasing. The following brief summary of the 12,722 wives included in this genealogical investigation is of exceptional interest:

TABLE II.

NUMBER AND PERCENTAGE OF CHILDLESS WIVES.

Statistics of 12,722 Wives included in Twenty-two Genealogical Records.

Period.	Total Number of Wives.	Childless Wives.	
		Number.	Per cent. of Total
Previous to 1700	276	5	1.81
1700–1749	802	14	1.74
1750–1799	1,966	37	1.88
1800–1849	5,530	225	4.07
1850–1869	3,062	181	5.91
1870–1879	1,086	88	8.10

In the seventeenth and eighteenth centuries less than 2 per cent. of the wives were childless; in the first half of the nineteenth century the proportion jumped to over 4 per cent., and this latter figure had doubled by 1870 to 1879. In census and other sources there is evidence that at present there is a far larger proportion of childless wives among the native American women than is indicated by the statistics here presented for the decade 1870 to 1879.

Closely related to the subject of childless wives is that of the number of children borne by the mothers. The following summary table brings out some significant facts:

TABLE III.

COMPARATIVE FECUNDITY OF NATIVE AMERICAN MOTHERS.

Statistics of 12,172 Mothers included in Twenty-two Genealogical Records.

Period.	Mothers with only One Child.		Mothers with only Two Children.		Mothers with Three to Five Children.		Mothers with Six to Nine Children.		Mothers with Ten or More Children.	
	Number.	Per Cent. of Total Wives.	Number.	Per Cent. of Total Wives.	Number.	Per Cent. of Total Wives.	Number.	Per Cent. of Total Wives.	Number.	Per Cent. of Total Wives.
Previous to 1700.. ..	5	1.81	11	4.00	49	17.76	139	50.36	67	24.27
1700–1749..	33	4.11	56	6.98	176	21.95	344	42.89	179	22.32
1750–1799..	98	4.98	118	6.00	531	17.01	796	40.50	386	19.63
1800–1849..	440	7.96	657	11.88	2,088	37.75	1,613	29.17	507	9.17
1850–1869..	428	13.98	625	20.41	1,275	41.64	481	15.71	72	2.36
1870–1879..	202	18.60	265	24.40	434	39.96	93	8.57	4	0.37

These statistics make it very clear that the wives of native Americans are not only remaining childless in increasingly large numbers, but that a rapidly increasing proportion are electing to bear not more than one child, two children, or three children. As a necessary corollary the number of native American wives who elect to bear large families of from six to nine children, and ten or more children, are becoming extremely rare. This summer at a boarding-house where several families were stopping, only one American mother had as many as two children. The little girl of a one-child mother innocently inquired if the mother with two children was an American.

In the period previous to 1700 1.8 or less than 2 per cent. of the wives had only one child, while in 1870 to 1879, 18.6 per cent. of the wives had only one child. On the other hand, previous to 1700, 24.3 per cent. of the wives had families of ten or more children, but by 1870 to 1879 the corresponding per cent. was only 0.37.

As a result of these most significant changes in native American families, it necessarily follows that the average number of children per wife has decreased, as is clearly shown in Table I.

The age at marriage was noted of 2,252 brides and the average age of these by chronological periods was as follows:

TABLE IV.

AGE OF BRIDES AT MARRIAGE.

Period.	Number of Brides.	Aggregate o the Ages.	Average Age at Marriage.
Previous to 1700	30	642	21.4
1700–1749	147	3,196	21.7
1750–1799	284	6,236	22.0
1800–1849	969	21,617	22.3
1850–1869	633	14,512	22.9
1870–1879	189	4,374	23.1

These figures are significant of the change that has taken place in the average age at marriage. They indicate that the American bride of today is approximately two years older, on an average, than the American bride of the seventeenth century. The increase in the average age has apparently been quite gradual throughout the period under observation. A confirmation of the increasing average age of brides is found in the Massachusetts returns over a long period of years. The decline in the birth-rate of American wives cannot, however, be explained away by this average increase in the age at marriage. Granting that the period of fecundity is limited and that two years lost is an important item, it obviously is not sufficient to account for a decline in the average number of births per wife from 7.37 to 2.77.

The statistics here brought together present an awful indictment against the morals of the Americans of today. France has long been an example to the world of the Malthusian doctrines carried to an extreme, but the United States today presents a spectacle, in this respect, which it is doubtful if France can equal. In the United States, the native stock which should take some pride in its own perpetuation is rapidly dwindling to mere nothingness, while the triumphant immigrants are submerging it by sheer force of their greater virility as revealed in their much higher birth-rates.

If the genealogical records teach anything, it is this, that unless a radical change is effected very soon, the stock which founded this nation and which nurtured it through the grave perils and trials of the formative period, will soon have vanished

from the face of the earth. Unless a radical change is soon effected the historian of no far distant period will be compelled to say that the descendants of the colonizers of the United States preferred material luxuries to spiritual realities, lustful conceits to correct theories of life, and selfish gratifications of inordinate ambitions to unselfish acceptance of the duties of parenthood. It is a very real condition and not a mere theory that now confronts the native element of the population of this republic, and Mr. Roosevelt has sounded no false alarm in his vigorous preachments against race suicide.

TABLE A.

STATISTICS OF BIRTHS COMPILED FROM TWENTY-TWO GENEALOGICAL RECORDS OF AMERICAN FAMILIES.

Number of Children per Wife.	Previous to 1700.		1700–1749.		1750–1799.		1800–1849.		1850–1869.		1870–1879.	
	Number of Wives.	Per Cent. of Total.	Number of Wives.	Per Cent. of Total.	Number of Wives.	Per Cent. of Total.	Number of Wives.	Per Cent. of Total.	Number of Wives.	Per Cent. of Total.	Number of Wives.	Per Cent. of Total.
None	5	1.81	14	1.75	37	1.88	225	4.07	181	5.91	88	8.10
1	5	1.81	33	4.11	98	4.98	440	7.96	428	13.98	202	18.60
2	11	3.99	56	6.98	118	6.00	657	11.88	625	20.41	265	24.40
3	9	3.26	46	5.74	133	6.76	749	13.54	545	17.80	210	19.34
4	11	3.99	60	7.48	184	9.36	700	12.66	447	14.60	147	13.53
5	29	10.51	70	8.73	214	10.89	639	11.55	283	9.24	77	7.09
6	34	12.32	92	11.47	204	10.38	559	10.11	211	6.89	51	4.70
7	26	9.42	101	12.59	195	9.92	402	7.29	149	4.87	22	2.03
8	47	17.03	85	10.60	216	10.99	367	6.64	81	2.64	11	1.01
9	32	11.59	66	8.23	181	9.21	284	5.13	40	1.31	9	0.83
10	29	10.51	55	6.86	148	7.53	218	3.94	35	1.14	4	0.37
11	19	6.88	48	5.99	119	6.05	142	2.57	18	0.59	.....	.....
12	11	3.99	37	4.61	41	2.09	75	1.36	7	0.23	.....	.....
13	4	1.45	18	2.24	46	2.34	37	0.67	7	0.23	.....	.....
14	3	1.08	12	1.50	14	0.71	17	0.31	2	0.07	.....	.....
15	.....	.....	4	0.50	10	0.51	5	0.09	2	0.07	.....	.....
16	1	0.36	2	0.25	2	0.10	5	0.09	1	0.03	.....	.....
17	.....	.....	.....	.....	2	0.10	4	0.07	.....	.....	.....	.....
18	.....	.....	1	0.12	3	0.15	3	0.05	.....	.....	.....	.....
19	.....	.....	2	0.25	1	0.05	1	0.02	.....	.....	.....	.....
Total	276	100.00	802	100.00	1,966	100.00	5,530	100.00	3,062	100.00	1,086	100.00

SUMMARY.

0–2	21	7.61	103	12.84	253	12.86	1,322	23.91	1,234	40.30	555	51.10
3–5	49	17.76	176	21.95	531	17.01	2,088	37.75	1,275	41.64	434	39.96
6–9	139	50.36	344	42.89	796	40.50	1,613	29.17	481	15.71	93	8.57
10 and over	67	24.27	179	22.32	386	19.63	507	9.17	72	2.36	4	0.37

TABLE B.

NUMBER OF CHILDREN PER WIFE.

STATISTICS COMPILED FROM TWENTY-TWO GENEALOGICAL RECORDS OF AMERICAN FAMILIES.

Children per Wife.	Previous to 1700.		1700–1749.		1750–1799.		1800–1849.		1850–1869.		1870–1879.	
	Number of Wives.	Aggregate Number of Children.	Number of Wives.	Aggregate Number of Children.	Number of Wives.	Aggregate Number of Children.	Number of Wives.	Aggregate Number of Children.	Number of Wives.	Aggregate Number of Children.	Number of Wives.	Aggregate Number of Children.
None	5	0	14	0	37	0	225	0	181	0	88	0
1	5	5	33	33	98	98	440	440	428	428	202	202
2	11	22	56	112	118	236	657	1,314	625	1,250	265	530
3	9	27	46	138	133	399	749	2,247	545	1,635	210	630
4	11	44	60	240	184	536	700	2,800	447	1,788	147	588
5	29	145	70	350	214	1,070	639	3,195	283	1,415	77	385
6	34	204	92	552	204	1,224	559	3,354	211	1,266	51	306
7	26	182	101	707	195	1,365	403	2,821	149	1,043	22	154
8	47	376	85	680	216	1,728	367	2,936	81	648	11	88
9	32	288	66	594	181	1,629	284	2,556	40	360	9	81
10	29	290	55	550	148	1,480	218	2,180	35	350	4	40
11	19	209	48	528	119	1,309	142	1,562	18	198	.....	.....
12	11	132	37	444	41	492	75	900	7	84	.....	.....
13	4	52	18	234	46	598	37	481	7	91	.....	.....
14	3	42	12	168	14	196	17	238	2	28	.....	.....
15	.....	.....	4	60	10	150	5	75	2	30	.....	.....
16	1	16	2	32	2	32	5	80	1	16	.....	.....
17	.....	.....	.....	.....	2	34	4	68	.....	.....	.....	.....
18	.....	.....	1	18	3	54	3	54	.....	.....	.....	.....
19	.....	.....	2	38	1	19	1	19	.....	.....	.....	.....
Total	276	2,034	802	5,478	1,966	12,649	5,530	27,320	3,062	10,630	1,086	3,004
Average number of children per wife	7.37		6.83		6.43		4.94		3.47		2.77	

IMMIGRATION AS A SOURCE OF URBAN INCREASE.

By F. Stuart Chapin, Ph. D., *Assistant Professor of Sociology and Economics, Smith College.*

There are no direct records of the composition of urban increase in the United States for the last two census decades, hence resort must be had to an indirect method of estimating the composition of urban growth. Professor John M. Gillette estimated in 1911 that from 65 to 70 per cent. of the urban growth of the United States in recent years was composed of immigrants.* The present paper is an effort to determine the contribution to the growth of cities in the United States made by immigration during the period 1890 to 1913.

It will be seen from Table I, that the total immigration to the United States during the decade 1890–1900 was equivalent to a large proportion of the urban increase (considering only places of 8,000 inhabitants and over as urban) for the same period; that the total immigration to the United States during the decade 1900–1910 was actually greater than the total urban increase for the same period; and that the total immigration 1910–1913 was equivalent to a large proportion of the estimated urban increase for the same period.

Now the immigration of recent years is localized to a marked degree. Table I shows that during the decades 1890–1900, 1900–1910, and the period 1910–1913, 75 per cent., 77.2 per cent., and 79.3 per cent., respectively, of the immigration to this country was destined to the nine states California, Connecticut, Illinois, Massachusetts, Michigan, New Jersey, New York, Ohio, and Pennsylvania. Since 1895 the Commissioner Generals of Immigration, and for the years 1892–1894 the Superintendents of Immigration, have recorded every year the number of immigrants destined to each state and territory. The immigration to these nine states for the year 1891 was estimated on the assumption that it was approximately equivalent to the average immigration for the period 1892–1900. But in dealing with these statistics of immigration the Commissioner warns us, "It should be borne in mind that

* Drift to the City in Relation to the Rural Problem, Amer. Jour. of Sociology, Vol. 16, p. 645.

neither the information in regard to occupations, nor that giving destinations is conclusive of the facts stated. The destination is taken from the avowed purposes of the aliens upon that point, which, if true, are subject to change."*

An examination of the distribution of the population of these states shows that in 1890, 1900, and 1910 the urban population formed respectively 66.4 per cent., 67.4 per cent., and 63.7 per cent. of the urban population of the country (see Table II). Individually, these states are highly urbanized communities, for in 1890, 1900, and 1910 their average urban population formed respectively, 45.8 per cent., 51.6 per cent., and 59.9 per cent. of their populations. Moreover, these averages are decidedly higher than the percentage urban population of the United States as a whole, which was 29 per cent., 32.9 per cent., and 38.8 per cent. for the same dates.

In composition, the populations of these states averaged over 50 per cent. of foreign birth and parentage in 1900 and 1910. The percentages of the population of the great cities of these states which are of foreign birth and parentage are considerably higher than in the states at large. For example, in the cities of New York, Chicago, Boston, Cleveland, Bridgeport, Worcester, Fall River, Detroit, Buffalo, and Paterson, the population of foreign birth and parentage ranges from 70.7 per cent. in Worcester, to 86 per cent. of the population in Fall River.

A comparison of the urban increase of these nine states with the urban increase for the country for the decades 1890–1900 and 1900–1910, reveals the fact that the urban increase of these nine states formed respectively 70.1 per cent. and 63.6 per cent. of the total urban increase of the country during the decades named. In the decade 1890–1900, the immigration to these states was equivalent to 58.4 per cent. of their urban gain for the same decade. In the decade 1900–1910, the immigration to these states was actually very much greater than their urban gain. But it must be noted that these totals do not take account of the number of aliens who have left the nine states during the same period. Since 1908, the Commissioner has recorded annually the number of aliens leaving each state.

* Annual report of 1905, p. 14.

If we deduct this number from the number of immigrants destined to these states, we have the net immigration to these states—the permanent gain from immigration. Proceeding in this manner, we find that the net immigration to these states for the period 1908 to 1913, is 69.9 per cent. of the total immigration for the same period. Thus about 70 per cent. of the immigration appears to be permanent gain.

But the problem of estimating the net immigration to these states for the decades 1890–1900 and 1900–1910, now arises. Is it permissible to apply this percentage obtained from the short period 1908 to 1913, to the decades 1890–1900 and 1900–1910? We shall not attempt to apply this percentage to the decade 1890–1900, chiefly for the reason that the recent immigration has shown itself to be more migratory than that of the earlier period and our correction percentage, even if we could get it, would probably be much smaller. Since all we can hope for from the application of this indirect method of estimating the composition of urban increase is approximately correct results, it seems best to accept the percentage 58.4 for the earlier decade as being fairly accurate.

With reference to the decade 1900–1910, we may assume that the percentage obtained from the period 1908 to 1913 applies. This assumption has at least the advantage of conservatism, *i. e.*, of making the net immigration appear smaller than it really is, because general considerations lead us to believe that the migratory and shifting elements in the recent immigration were much less numerous prior to 1907 and particularly in the early years of the decade. For it must be remembered that during the years immediately prior to 1907 and subsequently, the proportion of immigrants from Southern and Eastern Europe has increased considerably, and it is just this alien element which has added to the migratory and shifting character of our foreign population. If, therefore, we assume that 70 per cent. of the immigration to the nine states in the decade 1900–1910 was approximately clear gain, then the 5,001,295 aliens so added to the population of these states are equivalent to 85.2 per cent. of the urban gain for that decade. Similarly, the net immigration to these states for the period 1910–1913 is equivalent to 64.1 per cent. to the estimated urban increase.

Inasmuch as immigration appears to have been the preponderating source of urban increase in those nine highly urbanized states which contain a majority of the urban population of the country, it is permissible to conclude that immigration has been the chief source of urban increase in the United States during the past quarter of a century.

TABLE I.

COMPARISON OF URBAN GAINS AND IMMIGRATION 1890-1913.

State.	Urban Gain, Periods.		
	1890–1900.	1900–1910.	1910–1913.*
California	154,612	558,802	281,285
Connecticut	108,589	181,122	76,447
Illinois	785,995	696,432	306,492
Massachusetts	567,692	514,404	221,624
Michigan	201,239	321,326	146,492
New Jersey	372,089	463,659	196,257
New York	1,380,165	1,759,939	747,923
Ohio	440,498	584,260	270,947
Pennsylvania	713,886	786,264	278,557
Total	4,724,765	5,866,208	2,526,004
Total for U. S.	6,736,095	9,227,030	3,958,253
Per cent. urban gain in 9 states is of urban gain of U. S.	70.1	63.6	63.8
Immigration and Urban Gain.	**1890–1900.**	**1900–1910.**	**1910–1913.**
Immigration to nine states	2,768,659	7,144,702	2,313,570
Immigration to United States	3,687,564	9,243,958	2,914,651
Per cent. immigration to nine states is of immigration to United States	75.0	77.2	79.3
Per cent. immigration to nine states is of urban gain	58.4	85.2†	64.1†

* Estimated, Census Bulletin No. 122.

† Based on net immigration, given in Reports of Commissioner General of Immigration 1908–1913 and computed for period 1900–1910. Total immigration to nine states 1908–1913 was 4,343,532, net 3,024,815. Net immigration 1910–1913 was 1,619,499, estimated for 1900–1910 at 5,001,295, this is 85.2 per cent. of urban gain for same period (see above).

TABLE II.

URBAN POPULATION (PLACES OF 8,000 INHABITANTS AND OVER).

State.	Urban Population.			Per Cent. Urban.		
	1890.	1900.	1910.	1890.	1900.	1910.
California	495,086	649,474	1,275,359	40.8	43.7	53.6
Connecticut	376,479	483,069	805,992	50.4	53.2	72.3
Illinois	1,485,955	2,271,940	3,049,443	38.8	47.1	54.0
Massachusetts	1,564,931	2,132,623	2,748,518	69.9	76.0	81.6
Michigan	546,095	747,334	1,123,558	26.1	30.9	39.5
New Jersey	780,912	1,153,001	1,672,922	54.0	61.2	65.5
New York	3,599,877	4,980,042	6,817,433	60.0	68.5	73.1
Ohio	1,159,342	1,599,840	2,279,449	31.6	38.5	49.9
Pennsylvania	2,152,051	2,865,937	3,828,482	40.9	45.5	49.9
Total and averages	12,160,628	16,885,393	22,751,601	45.8	51.6	59.9
For U. S. totals and Averages	18,295,410	25,031,505	35,724,432	29.0	32.9	38.8
Per cent. urban population of nine states is of total urban population of United States				66.4	67.4	63.7

AMERICAN LIFE TABLES.

By C. H. Forsyth, *Ann Arbor, Mich.*

The purpose of this paper is to present the first mortality tables ever constructed in this country, based on population data and mortality statistics covering as many as ten years. The methods used in their construction is also briefly explained.

Three mortality tables are given: one for the males, one for the females, and one for males and females combined, and all are based on data covering the decade 1901–1910.

The decade 1901–1910 represents the first period in which mortality statistics were collected and published annually by the government, previous reports having been made decennially. Other countries—such as England, Germany and France—have not only been collecting and publishing mortality statistics annually for many decades but have constructed appropriate mortality tables exhibiting the death-rates, expectations of life, etc., at each age. This country is far behind the most prominent countries in this respect, less than half of the total number of the states being compelled at present to keep any accurate record of deaths.

However, the work of the government in the collection of mortality statistics is exceedingly worthy of commendation considering how recent the main part of the work was begun (1880) and the strides made in those years, particularly the last decade.

The data used in this paper were collected from those states whose records are considered sufficiently accurate by the government to be designated formally as registration states.* These registration states, together with about one hundred and fifty cities in non-registration states, comprise the so-called registration area proper.

In 1900 the registration states included Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and the District of Columbia. In 1906 there were added the states California, Colorado, Maryland, Pennsylvania, and South

* See Bulletin 104, Mortality Statistics, 1908, p. 7.

Dakota, although South Dakota's report was rejected in 1910. Washington and Wisconsin were added in 1908, Ohio in 1909, and Minnesota, Montana, and Utah in 1910.

As the population data are collected only once in each ten years, they were assumed to change from year to year by a constant difference.

It was taken into consideration that the census for 1900 was taken as of June 1 and that for 1910 as of April 15. For example, the population at June 1, 1901, was taken as the population at June 1, 1900, plus 6-79 of the difference between the populations at June 1, 1900 and April 15, 1910.

The population at January 1 for any year was found by adding to the population at June 1 (or April 15) 5-12 (or 7-24) of the deaths for that year, on the assumption that deaths take place uniformly throughout the year.

The total data used covered not only the eleven original registration states (as of 1900) but all that became registration states during the decade 1901–1910. Thus twenty-two states were included. North Carolina was not included because the appropriate population data were not available by ages (being wholly urban).

The mortality statistics are given in quinquennial age groups, except at the earlier ages from 0 to 4 inclusive, at which the deaths are given for each age.

The population data are given in quinquennial age groups except at the higher ages beginning with age 65 at which the data are given in decennial age groups.

The decennial age groups were broken up into quinquennial age groups by ordinary third differences and the quinquennial age groups, both for population and mortality data, were broken up into data for each age by first forming columns of T_x from each set of data, where T_x represents the number (deaths or population) at age x and all higher ages, and interpolating the four intervening values for each group—except, of course, the two at each end—by Sprague's Osculatory method.* This method cannot be explained here, as space will not permit. We merely state that the method has the advantage over the use of ordinary fifth differences in that

* The Record, American Institute of Actuaries, Vol. I, No. 3, June, 1911, p. 9.

the curvature as well as the slope of the curve, representing the values under discussion, is considered, with the result that the curve, which would otherwise be somewhat "undulating," becomes very smooth throughout.

The two quinquennial age groups at each end were interpolated by ordinary third differences (taken centrally in the case of the inner groups).

The first quinquennial age group of the population data, however, was an exception, because use was made of the population as given for those at the age of birth. The values used as a basis for interpolation being no longer equidistant—as is necessary in the use of ordinarry differences—La Grange's interpolation formula was used to obtain the population at ages 2, 3, and 4.

The work of constructing mortality tables (such as are presented in this paper) would be much easier if the census would include tables of populations for the different divisions of the registration area as given in the mortality statistics, this area being the only area of any value for such purposes. The conflicting definitions of "urban" and "rural" population used by the census and in the mortality statistics is also unfortunate and could be easily remedied.

The death-rates in the neighborhood of age 90 are doubtlessly so unreliable that refined methods of extending the tables beyond that age are not worth while. However, for the purpose of computing the expectation of life (a function little affected by choice of methods of terminating the mortality tables) for each age, the tables were completed by using ordinary third differences, as applied to the death-rates at ages 70, 75, 80 and 85, to estimate the death-rates at higher quinquennial ages. The intervening death-rates were interpolated by Sprague's method mentioned above.

In conclusion, tables are given comparing the death-rates and expectations of life at representative ages of the American mortality tables, presented in this paper, with those of similar tables constructed in England and Wales,* and the German Empire.* However, it must be kept in mind that the latter

* Sixty-fifth Annual Report of the Registrar-General. Supplement 1891–1900, Part I, p. xlii.
* Deutsche Sterbetafeln 1891–1900. Band 200, Seite 2.

tables are based on data covering the decade 1891–1900 while the American tables refer to the decade 1901–1910.

The English and German death-rates exceed the American rates everywhere except in the neighborhood of ages 10 and 20, and even here there is no essential difference. The American death-rates are relatively very low at the age of birth, the German rates seeming very excessive.

As might be expected, on considering the table of representative death-rates, the American expectations of life far exceed those of England and Wales, and the German Empire, the average length of life in America being about 50 years, compared with about 46 years in England and Wales, and about 42 years in the German Empire. Of course, a comparison of tables all covering the same decade, such as 1901–1910, would not show results so much in favor of American conditions, but there can be no doubt that there is an actual advantage which is considerable. This advantage seems natural and there appears no reason why it can not be maintained. In our minds, no one thing would conduce more to this end than to identify as soon as possible the whole of the United States with the registration area. In fact, to have a single state—not to speak of over half of the union—in which no accurate record of deaths is required, should be regarded as a national disgrace.

MALES.

Age.	l_x.	d_x.	q_x.	$\mathring{e}_x$.	Age.	l_x.	d_x.	q_x.	$\mathring{e}_x$.
0	1000000	142420	.14243	48.34	50	576439	9079	.01575	20.59
1	857570	26310	3068	55.15	51	567360	9282	1636	19.94
2	831260	11579	1393	55.94	52	558078	9554	1712	19.25
3	819681	7180	876	55.70	53	548524	9956	1815	18.56
4	812501	5363	660	55.22	54	538568	10486	1947	17.86
5	807138	3971	.00492	54.27	55	528082	11063	.02095	17.22
6	803167	3438	428	53.93	56	517019	11736	2270	16.59
7	799729	2983	373	53.13	57	505283	12425	2459	15.97
8	796746	2605	327	52.33	58	492858	13002	2638	15.36
9	794141	2311	291	51.53	59	479856	13455	2804	14.75
10	791830	2122	.00268	50.66	60	466401	13908	.02982	14.16
11	789708	2006	254	49.79	61	452493	14308	3162	13.60
12	787702	1993	253	48.92	62	438185	14762	3369	13.04
13	785709	2059	262	48.03	63	423423	15379	3632	12.47
14	783650	2218	283	47.16	64	408044	16134	3954	11.89
15	781432	2657	.00340	46.34	65	391910	16860	.04302	11.36
16	778775	2998	385	45.46	66	375050	17612	4696	10.78
17	775777	3336	430	44.63	67	357438	18183	5087	10.36
18	772441	3646	472	43.86	68	339255	18377	5417	9.89
19	768795	3915	509	43.03	69	320878	18284	5698	9.43
20	764882	4184	.00547	42.25	70	302594	18141	.05995	8.97
21	760698	4465	587	41.48	71	284453	17869	6282	8.51
22	756233	4674	618	40.74	72	2665[illegible]4	17707	6642	8.05
23	751559	4780	636	39.96	73	248877	17810	7156	7.58
24	746779	4832	647	39.22	74	231067	18090	7829	7.12
25	741947	4786	.00645	38.48	75	212977	18254	.08571	6.69
26	737161	4909	666	37.74	76	194723	18360	9429	6.27
27	732252	5031	687	36.98	77	176363	18299	10376	5.87
28	727221	5156	709	36.24	78	158064	17978	11374	5.49
29	722065	5286	732	35.49	79	140086	17452	12458	5.13
30	716779	5405	.00754	34.75	80	122634	16973	.13840	4.79
31	711374	5791	814	34.01	81	105661	16615	15725	4.48
32	705583	5659	802	33.28	82	89046	15785	17726	4.22
33	699924	6723	833	32.55	83	73261	14065	19198	4.02
34	693201	6010	867	31.86	84	59196	11795	19925	3.86
35	687191	6192	.00901	31.14	85	47401	9099	.19196	3.70
36	680999	6374	936	30.41	86	38302	7786	20328	3.46
37	674625	6537	969	29.71	87	30516	66231	21705	3.21
38	668088	6661	997	28.98	88	23893	5595	23416	2.97
39	661427	6773	1024	28.28	89	18298	4682	25588	2.72
40	654654	6894	.01053	27.55	90	13616	3867	.28403	2.48
41	647760	7022	1084	26.85	91	9749	3026	31036	2.27
42	640738	7176	1120	26.13	92	6723	2286	34002	2.07
43	633562	7387	1166	25.42	93	4437	1656	37333	1.87
44	626175	7633	1219	24.72	94	2781	1142	41057	1.69
45	618542	7899	.01277	24.02	95	1639	741	.45205	1.52
46	610643	8189	1341	23.32	96	898	447	49807	1.36
47	602454	8458	1404	22.63	97	451	248	54893	1.21
48	593996	8684	1462	21.95	98	203	123	60493	1.07
49	585312	8873	1516	21.27	99	80	53	66638	.94
					100	27	20	.73356	.80
					101	7	6	80678	.64
					102	1	1	88635	.50
					103	0			

FEMALES.

Age.	l_x.	d_x.	q_x.	$\mathring{e}_x$.	Age.	l_x.	d_x.	q_x.	$\mathring{e}_x$.
0	1000000	116380	.11638	51.92	50	627304	8029	.01280	21.95
1	883620	24803	2807	57.69	51	619275	8348	1348	21.22
2	858817	9859	1148	58.34	52	610927	8706	1425	20.50
3	848958	8074	951	58.02	53	602221	9124	1515	19.79
4	840884	5205	619	57.57	54	593097	9626	1623	19.09
5	835679	3886	.00465	56.86	55	583471	10193	.01747	18.40
6	831793	3352	403	56.18	56	573278	10829	1889	17.71
7	828441	2908	351	55.41	57	562449	11513	2047	17.05
8	825533	2534	307	54.61	58	550936	12154	2206	16.39
9	822999	2255	274	53.76	59	538782	12731	2363	15.75
10	820744	2118	.00258	52.92	60	526051	13309	.02530	15.12
11	818626	1981	242	52.05	61	512742	13824	2696	14.50
12	816645	1935	237	51.18	62	498918	14389	2884	13.89
13	814710	1996	245	50.29	63	484529	15093	3115	13.29
14	812714	2137	263	49.42	64	469436	15919	3391	12.69
15	810577	2578	.00318	48.55	65	453517	16721	.03687	12.12
16	807999	2917	361	47.71	66	436796	17520	4011	11.57
17	805082	3228	401	46.88	67	419276	18251	4353	11.03
18	801854	3488	435	46.05	68	401025	18828	4695	10.51
19	798366	3696	463	45.26	69	382197	19270	5042	10.00
20	794670	3918	.00493	44.46	70	362927	19682	.05423	9.51
21	790752	4144	524	43.67	71	343245	20001	5827	9.03
22	786608	4318	549	42.91	72	323244	20248	6264	8.55
23	782290	4475	571	42.10	73	302996	20434	6744	8.09
24	777815	4574	588	41.39	74	282562	20554	7274	7.64
25	773241	4678	.00605	40.63	75	262008	20560	.07847	7.20
26	768563	4788	623	39.88	76	241448	20414	8455	6.77
27	763775	4881	639	39.12	77	221034	20253	9163	6.35
28	758894	4971	655	38.38	78	200781	20174	10048	5.93
29	753923	5051	670	37.62	79	180607	20158	11161	5.55
30	748872	5130	.00685	36.86	80	160449	20127	.12544	5.18
31	743742	5206	700	36.11	81	140322	20264	14441	4.85
32	738536	5288	716	35.37	82	120058	19732	16435	4.58
33	733248	5375	733	34.62	83	100326	17822	17764	4.39
34	727873	5466	751	33.88	84	82504	15054	18246	4.23
35	722407	5555	.00769	33.13	85	67450	11827	.17534	4.06
36	716852	5642	787	32.38	86	55623	10280	18481	3.81
37	711210	5718	804	31.63	87	45343	8896	19620	3.57
38	705492	5778	819	30.88	88	36447	7665	21031	3.31
39	699714	5836	834	30.13	89	28782	6573	22838	3.06
40	693878	5898	.00850	29.38	90	22209	5619	.25300	2.82
41	687980	5979	869	28.63	91	16590	4547	27405	2.61
42	682001	6090	893	27.87	92	12043	3582	29740	2.40
43	675911	6252	925	27.13	93	8461	2735	32325	2.20
44	669659	6449	963	26.36	94	5726	2014	35180	2.02
45	663210	6665	.01005	25.63	95	3712	1423	.38325	1.84
46	656545	6907	1052	24.88	96	2289	956	41780	1.68
47	649638	7166	1103	24.14	97	1333	607	45564	1.52
48	642472	7440	1158	23.41	98	726	361	49697	1.37
49	635032	7728	1217	22.67	99	365	198	54200	1.23
					100	167	99	.59092	1.10
					101	68	44	64393	.99
					102	24	17	70123	.88
					103	7	5	76301	.79
					104	2	2	82948	.50
					105	0			

MALES AND FEMALES, COMBINED.

Age.	l_x.	d_x.	q_x.	$\overset{\circ}{e}_x$.	Age.	l_x.	d_x.	q_x	$\overset{\circ}{e}_x$.
0	1000000	129630	.12963	50.08	50	601198	8615	.01433	21.25
1	870370	25580	2939	56.49	51	592583	8877	1498	20.53
2	844790	10687	1265	57.14	52	583706	9193	1575	19.84
3	834103	7590	910	56.88	53	574513	9600	1671	19.15
4	826513	5290	640	56.37	54	564913	10118	1791	18.48
5	821223	3934	.00479	55.77	55	554795	10691	.01927	17.80
6	817289	3400	416	55.05	56	544104	11345	2085	17.15
7	813889	2946	362	54.26	57	532759	12030	2258	16.50
8	810943	2571	317	53.45	58	520729	12633	2426	15.86
9	80·372	2288	283	52.64	59	508096	13144	2587	15.26
10	806084	2120	.00263	51.77	60	494952	13656	.02759	14.65
11	803964	1994	248	50.90	61	481296	14107	2931	14.06
12	801970	1965	245	50.01	62	467189	14614	3128	13.47
13	800005	2024	253	49.15	63	452575	15270	3374	12.86
14	797981	2178	273	48.27	64	437305	15765	3605	12.32
15	795803	2618	.00329	47.39	65	421540	16828	.03991	11.75
16	793185	2959	373	46.57	66	404712	17597	4348	11.21
17	790226	3287	416	45.74	67	387115	18241	4712	10.71
18	786939	3565	453	44.91	68	368874	18624	5049	10.20
19	783374	3799	485	44.15	69	350250	18787	5364	9.73
20	779575	4054	.00520	43.31	70	331463	18913	.05706	9.26
21	775521	4304	555	42.53	71	312550	18919	6053	8.76
22	771217	4504	584	41.81	72	293631	18948	6453	8.30
23	766713	4623	603	41.03	73	274683	19088	6949	7.84
24	762090	4702	617	40.29	74	255595	19292	7548	7.39
25	757388	4741	.00626	39.55	75	236303	19379	.08201	6.97
26	752647	4855	645	38.76	76	216924	19358	8924	6.54
27	747792	4965	664	38.02	77	197566	19243	9740	6.12
28	742827	5066	682	37.26	78	178323	19036	10675	5.75
29	737761	5179	702	36.52	79	159287	18754	11774	5.38
30	732582	5282	.00721	35.76	80	140533	18487	.13155	5.00
31	727300	5520	759	35.06	81	122046	18361	15044	4.70
32	721780	5486	760	34.29	82	103685	17666	17038	4.43
33	716294	5623	785	33.58	83	86019	15850	18426	4.25
34	710671	5764	811	32.81	84	70169	15339	19010	4.09
35	704907	5900	.00837	32.08	85	56830	10388	.18279	3.94
36	699007	6039	864	31.36	86	46442	8961	19295	3.72
37	692968	6160	889	30.63	87	37481	7692	20522	3.48
38	686808	6257	911	29.88	88	29789	6566	22042	3.25
39	680551	6350	933	29.15	89	23223	5568	23977	3.03
40	674201	6445	.00956	28.45	90	17655	4686	.26555	2.81
41	667756	6551	981	27.69	91	12969	3642	28851	2.65
42	661205	6691	1012	26.97	92	9327	2030	31416	2.50
43	654514	6879	1051	26.22	93	7297	2501	34274	2.06
44	647635	7105	1097	25.50	94	4796	1796	37449	1.88
45	640530	7347	.01147	24.77	95	3000	1229	.40965	1.71
46	633183	7611	1202	24.08	96	1771	794	44845	1.54
47	625572	7882	1260	23.35	97	977	480	49114	1.39
48	617690	8129	1316	22.64	98	497	267	53796	1.25
49	609561	8363	1372	21.93	99	230	135	58913	1.11
					100	95	61	.64491	.98
					101	34	24	70553	.85
					102	10	8	77122	.70
					103	2	2	84223	.50
					104	0			

DEATH-RATES.*

Age.	Males.			Females.			Males and Females.	
	English.	German.	American.	English.	German.	American.	German.	American.
0.....	.17186	.23386	.14243	.14066	.19862	.11638	.21670	.12963
10.....	.00214	.00304	.00268	.00231	.00322	.00258	.00313	.00263
20.....	.00457	.00507	.00547	.00414	.00459	.00493	.00518	.00520
30.....	.00671	.00655	.00754	.00618	.00696	.00685	.00676	.00721
40.....	.01190	.01094	.01053	.00995	.00901	.00850	.00995	.00956
50.....	.01936	.01860	.01575	.01495	.01288	.01230	.01560	.01433
60.....	.03596	.03395	.02982	.02928	.02751	.02530	.03051	.02759
70.....	.07212	.07342	.05995	.06243	.06786	.05423	.07038	.05706
80.....	.15200	.16384	.13840	.13626	.15575	.12544	.15933	.13155
90.....	.29186	.33597	.28403	.26378	.30239	.25300	.31551	.26555

EXPECTATIONS OF LIFE.*

Age.	Males.			Females.			Males and Females.	
	English.	German.	American.	English.	German.	American.	German.	American.
0.....	44.13	40.56	48.34	47.77	43.97	51.92	42.23	50.08
1.....	52.22	51.85	55.15	54.53	53.79	57.69	52.83	56.49
10.....	49.63	49.66	50.66	51.97	51.71	52.92	50.70	51.77
20.....	41.02	41.23	42.25	43.44	43.37	44.46	42.32	43.31
30.....	33.07	33.46	34.75	35.39	35.63	36.86	34.56	35.76
40.....	25.64	25.89	27.55	27.82	28.15	29.38	27.04	28.45
50.....	18.90	19.00	20.59	20.64	20.58	21.95	19.82	21.25
60.....	12.93	12.82	14.16	14.10	13.60	15.12	13.24	14.65
70.....	8.05	7.77	8.97	8.78	8.11	9.51	7.95	9.26
80.....	4.62	4.24	4.79	5.05	4.49	5.18	4.38	5.00
90.....	2.58	2.32	2.48	2.87	2.66	2.82	2.52	2.81

* The English and German tables are based upon the decade 1891–1900, while the American table is based upon the decade 1901–1910.

SERVICE INCOME AND PROPERTY INCOME.

By Scott Nearing, *Wharton School, University of Pennsylvania.*

Service *vs.* Property Ownership.

Heretofore, political economy has been content to discuss income under the heading of rent, interest, profits, and wages. The situation in the United States cannot be analyzed as it was by the English economists, since there is no American landlord class, and therefore no capitalist class distinct from the landlord class. Agricultural land, for the most part, is owned by individual farmers, or by persons of moderate means. The natural resources and the industries of the country are owned and capitalized through the corporate system of business organization. In England there is still a landlord who owns the coal lands, and a capitalist who develops them; in the United States, the natural resources are, for the most part, owned and developed by the same industrial group.

A classification loses virility whenever it becomes a mere abstraction. That classification only possesses real vitality which has some specific bearing on the conditions that it aims to describe. An appeal to the present income facts in the United States will alone provide a classification of income which will be really applicable to the conditions now prevailing.

Theories aside, an appeal to the world of affairs shows that the current industrial facts in the United States make the logical income distinction one between that income which is the product of effort, and that income which is the product of property ownership. The individual whose effort creates values for which society pays, receives service income. The individual who secures a return because of his property ownership receives a property income.

The importance of the contrast between service and property income is represented not by the fact that it will separate the working class from the leisure class, but that it will lay the basis for the elimination of exploitation, on the one hand,

and of economic parasitism, on the other hand. Economic salvation does not lie through class conflict, but through distinctions which will pay the worker the full value of his work, and drive the idler out of society.

The Basic Income Question.

The basic income question is one, not of theory, but of fact. Marginal acres, marginal dollars of capital, and marginal laborers may be figments of the economic imagination, or they may be symbols of a real economic distinction. In the city of Omaha or of Portland, in the factories of Brockton, in the sweatshops of Pittsburgh and New York, in the mines of West Virginia and Colorado, the marginal man is missing. In his place there appear great industrial enterprises which are engaged in the production of economic goods of a certain value. For these goods, or these values, the forces of the community contend. In that production and in that contention lies the real problem of distribution.

The matter may be made still more concrete. An industry —steel-making, for example—takes raw materials, and by the process of manufacture adds to them value equivalent to one hundred dollars. What part of that hundred dollars goes in wages and salaries to the workers in the industry? What part of it goes in interest and dividends to the owners of the stocks and bonds? The former receive service income; the latter, property income. What proportion of the values goes in either direction?

The income question, thus boldly stated, cannot be answered with absolute accuracy. Up to the present time, most industries have failed to issue public reports which permit of a full income analysis. In the very near future public bodies, such as the Interstate Commerce Commission, the public utilities and railroad commissions, and other similarly organized tribunals, will secure and compile this information. For the time being, almost the only authentic facts are those which have been collected and presented by the Interstate Commerce Commission, and by a few of the State public utilities commissions.

The compilation of income facts is a stupendous task, far beyond the energies of any one individual. The task will never be successfully completed until the government takes it in hand. Meanwhile, an individual, using the facts available, may point to the sharp distinction existing between income from services and income from property.

Many enthusiasts have hoped that when the facts were compiled there would appear some off-hand answer regarding the proportion of industrial income which was paid for services, and the proportion that was paid for property ownership. "Half and half," cries the agitator. "Sixty per cent. for wages, and 40 per cent. for dividends," vociferates his more conservative confrere. The most cursory study of the available facts reveals the groundlessness of this hope, and the fallacious nature of such assertions. When all of the income facts are analyzed, classified, and compiled, some government expert will be able to announce that of the total values created in the manufacturing industries, a given percentage goes for services, and another given percentage for property ownership. At the present time, however, the knowledge is but fragmentary. The proportions vary from industry to industry, and from establishment to establishment. Even at the present time, however. for a given group of establishments, and for certain industries, facts are available which show accurately what amount of the values produced in that segment of the industrial process goes for services, and what amount goes for property ownership. A long step toward an authentication of this general position is taken by Dr. Streightoff. Although he makes his statement incidentally, placing it in a footnote, he finds that reliable information is obtainable from official sources showing the apportionment of service and of property income in several large industries. Dr. Streightoff's note is as follows:

"Dr. Spahr, in his 'Essay on the Present Distribution of Wealth in the United States' (pp. 88–92, 120), has concluded that in Basel, France, Saxony, the United Kingdom, and the United States, 40 per cent. of the national incomes goes to capital, and 60 per cent. to labor. Recent available figures for eight large American industries, employing over

three million laborers, give to capital a return in dividends and interest of $1,276,419,050, and to labor in salaries and wages of $2,031,402,210, a total income of $3,307,821,260, of which the share of labor is 61 per cent., and that of capital 39 per cent. That these figures are typical of the whole field of American industry is questionable."*

TABLE I.

RETURNS OF CAPITAL AND LABOR IN EIGHT INDUSTRIES.

Industries.	Year.	Outstanding Capital Stock and Bonds.	Interest and Dividends.	Wages and Salaries.	Number of Employees.
Telegraphs	1902	$162,946,252	$8,206,975	$15,030,673	27,627
Telephones	1907	1,072,805,93	36,049,779	68,270,127	144,169
Express companies	1910	105,523,300	33,564,411	39,491,032	79,284
Central electric light and power stations	1907	1,341,995,182	46,142,902	31,935,309	42,066
Street and electric railways	1907	3,774,772,096	125,954,062	150,991,099	221,429
Incorporated mines and quarries	1902	3,217,719,458	86,020,837	354,079,476	528,720
185 Industrial combinations	1900	3,093,095,868	135,126,612	227,861,188	424,686
Steam railways	1910	18,417,132,238	805,353,472	1,143,725,306	1,699,420
Totals		$31,185,990,660	$1,276,419,050	$2,031,402,210	3,167,401

An examination of Streightoff's table shows several noteworthy facts. In the first place, all of the data relate to the decade 1900 to 1910. In the second place, six of the eight groups of industries are ordinarliy described as "public utilities." In the third place, the ratio between property income (interest and dividends) and service income (wages and salaries) is far from being a constant factor. For the eight groups of industries the ratio between property income and service income is four to six. Electric light and power stations give an opposite ratio of nine to six, while the industrial combinations report a ratio of one to four. The really interesting thing about the table is the fact that in 1912 an investigator was able to find eight groups of industries having a combined capitalization of thirty billions of dollars, all of which reported property income as distinct from service income.

The reason for the clarity of these reports as regards the distinction between property and service income lies ready

* "The Distribution of Incomes in the United States," F. H. Streightoff, New York, Columbia University Press, 1912, pp. 44, 45.

at hand. The public, in recent years, has showed a keen interest in property income. The predatory activities of certain corporations, together with the commonly accepted opinion that certain great businesses had "struck it rich," led to the appointment of commissions and other inquisitorial bodies, who were charged with this, among other duties, to find out how much these great enterprisers were making. The result of this public demand may be viewed in any library where State and Federal reports are on view.

Many accounts are so kept at the present time, either because business reasons demand it, or because government officials insist upon it, that the amounts paid for property and for service income may be readily ascertained. Such accounts must provide the basis for a study of the present-day income facts. The present study* purports to carry forward, if only for a few steps, the lines of income investigation which have been started by Hobson, Cannan, Spahr, Streightoff, and the other economists who are interested in income facts.

The Answer for Transportation Agencies.

Among all of the highly organized businesses, none are more highly organized than the transportation agencies, particularly the railroads. The pioneer work in railroading once completed, railroad managers were enabled to turn their attention to the problems of organization and administration. The result of their activities is a marvelously wrought business system which has been investigated, rounded out, and standardized by public authorities. For no group of industries is the information regarding property and service income so complete as it is for the railroads.

The problem may be stated in these general terms. A hundred dollars of value is created by an industry. Of this hundred dollars, how many dollars go in the form of service

* Throughout this study, the figures used are for 1909, 1910, and 1911, years which were arbitrarily necessitated by the availability of the figures. The census returns of the Thirteenth Census are for 1909. Most of the railroad and public utilities commissions are at least two years behind the calendar in the issue of reports. If the various groups of figures were to be at all comparable, they should be selected with some reference to the census year. Furthermore, the years 1910 and 1911 seemed fairly representative of normal business conditions. All of these reasons led to the use of data for 1910 and 1911 whenever it was available. In a few special cases 1912 data were used. These cases are, however, exceptional.

income, and how many dollars go in the form of property income? The answer will obviously vary with the character of the industry, so that an answer for railroads is not in any sense an answer for other industries. Neither will an answer for an entire industry hold good for individual railroads. The amount of income paid, particularly in the form of property income, must vary with the success of each separate business, and with the local conditions surrounding its operations.

The reader will remember that the railroad is a business involving a particularly heavy original outlay. The roadbed, terminals, rolling stock, the rights of way, and other initial charges on railroad construction are immense. Once made, these capital investments are unusually permanent. The process of making, however, involves a very heavy outlay. In 1911, railroad operations brought the railroads of the United States a revenue of $2,789,761,669. From other sources, such as rent credits, income received on the stocks, and bonds of companies under their control, and similar miscellaneous sources, the income was $77,815,345.* The total income of the railroads from all sources therefore was a little more than two and three quarters billions of dollars. During the same year, the total amount paid in wages and salaries was $1,208,466,470,† while the entire amount paid in the form of interest was $406,609,204, and the amount of dividends was $291,497,164, making the total of $698,106,368 paid out in the form of income for railroad property holdings.‡

Thus of the entire receipts for all of the railroads in the United States in 1911, three sevenths were paid in wages and salaries, and one fourth in interest and dividends. The approximate ratio between the amount of service income and the amount of property income on the railroads of the United States was therefore 12 to 7.

There is, of course, considerable variation from one part of the country to another, and from one class of railroads to another, in the ratio between service income and property income. The Interstate Commerce Commission has divided

* Statistics of the Railways in the United States, Interstate Commerce Commission, Washington, Government Printing Office, 1913, p. 53.

† *Ibid*, p. 29.

‡ *Ibid*, p. 53.

the country into three Districts,—the Eastern district, comprising "that portion of the United States bounded on the west by the northern and the western shore of Lake Michigan to Chicago, thence by a line to Peoria, thence to East St. Louis, thence down the Mississippi River to the mouth of the Ohio River, and on the south by the Ohio River from its mouth to Parkersburg, W. Va., thence by a line to the southwestern corner of Maryland, thence by the Potomac River to its mouth. The Southern District comprises that portion of the United States bounded on the north by the Eastern District, and on the west by the Mississippi River. The remainder of the United States, exclusive of Alaska and of island possessions, is included in the Western District."*

A similar division is made of the railroads into three classes based upon their financial importance. Class I includes those roads with gross operating revenues of $1,000,000 or more. Class II includes those roads which have gross operating revenues of $100,000, but of less than $1,000,000. Class III includes those roads which have revenues of under $100,000. An analysis of the returns from the United States by class and by districts shows that while the ratio between operating rail revenue and total compensation is comparatively stationary, at about 7 to 3, the ratio between the operating rail revenues and the total amount paid in interest and dividends varies considerably. On the larger roads (Class I) one fifth of the operating rail revenues is paid out in the form of interest and dividends in the East and in the South, while more than a quarter is so used in the West. The total of Class I roads shows a ratio between operating rail revenue and total interest and dividends of 4 to 1. On the Class II and Class III roads the ratio is slightly more than 5 to 1.

A brief summary of these facts compiled from the reports of the Commission gives an excellent idea of the general ratio on which the railroads disposed of $2,750,000,000 of gross earnings which they received in 1911.

* *Supra*, pp. 9, 10.

TABLE II.

OPERATING RAIL REVENUES, TOTAL COMPENSATION, AND TOTAL INTEREST AND DIVIDENDS, BY CLASSES AND DISTRICTS, FOR THE RAILROADS OF THE UNITED STATES. 1911.*

Classes and Districts.		Operating Rail Revenue.	Total Compensation.	Interest and Dividends.
Class I Roads	East	$1,180,093,370	$543,860,234	$233,945,112
	South	405,419,448	166,891,480	79,552,808
	West	1,107,005,585	457,104,180	312,426,020
	Total	$2,692,518,403	$1,167,855,894	$625,923,940
Class II Roads	East	$28,219,316	$12,358,326	$6,056,328
	South	11,588,011	4,223,821	2,639,861
	West	40,408,098	16,678,382	9,087,590
	Total	$80,215,425	$33,260,529	$17,783,779
Class III Roads	East	$4,158,947	$1,883,018	$835,461
	South	4,298,413	1,741,002	957,581
	West	8,570,481	3,726,027	1,983,436
	Total	$17,027,841	$7,350,047	$3,776,478
All Operating Roads	East	$1,212,471,633	$558,101,577	$240,836,911
	South	421,305,872	172,856,304	84,040,350
	West	1,155,984,164	477,508,589	160,917,046
	Total	$2,789,761,669	$1,208,466,470	$648,374,227

* *Supra*, p. 54, 55.

An analysis of the above table shows the Class II and Class III roads to be negligible factors. Together they report less than 5 per cent. of the total gross earnings. Interest must therefore center in the Class I roads, which are the important roads of the country. On these important roads, for each $100 paid in compensation, $54 is paid as interest and dividends. The ratio of service to property income is therefore, roughly, 7 to 4.

These facts derived from a general survey of the aggregate figures for the large roads of the United States may be checked and supplemented from various other sources. In addition to the reports published by the Interstate Commerce Commission, there are a number of states which publish reports on the railroads operating within the state boundaries, and upon certain railroads whose lines enter the state. An analysis of these figures throws additional light on the division of railroad revenue, by giving returns for individual states and individual roads.

The Public Service Commission for the First District of New York* reports for the steam railroads operating under its jurisdiction a total compensation of $559,544, and a total payment in interest and dividends of $209,792. The ratio of service income to property income is therefore approximately 5 to 2. These railroads are obviously of minor importance.

Two of the state railroad commissions publish returns for several of the larger railroad systems. The following table contains figures for a number of systems, compiled from the reports of the Minnesota and Iowa Commissions:†

TABLE III.

OPERATING REVENUES, TOTAL COMPENSATION, AND TOTAL INTEREST AND DIVIDENDS FOR CERTAIN RAILROAD SYSTEMS, 1911 AND 1912. (a)

Railroads.	Operating Revenues.	Total Yearly Compensation.	Total Interest and Dividends.	Ratio between Service and Property Income.
Chicago, Burlington and Quincy	$86,723,000	$35,208,000	$19,562,000	2-1
Chicago and Northwestern	73,699,000	33,088,000	19,227,000	11-6
Rock Island	61,871,000	26,982,000	16,755,000	3-2
Great Northern	66,161,000	22,517,000	27,296,000	3-4
Northern Pacific	63,424,000	24,198,000	27,020,000	6-7
Iowa Central	3,511,537	1,193,832	1,188,885	1-1
Santa Fé	89,164,217	34,740,915	28,046,045	5-4

(a) *Supra*, pp. 54, 55.

A glance at the last column of the table in which a rough estimate is made of the ratio of service income to property income will show the variation which always appears when individual establishments are compared. The ratio for all of the roads between gross earnings and compensation is fairly uniform, ranging from 3 to 1 in the case of the Great Northern, and Iowa Central, to 2½ to 1 in the case of the other roads. The ratio between revenues and the amounts paid in interest and dividends shows no such uniformity. For the Chicago, Burlington, and Quincy the ratio of service income to property income is 2 to 1; for the Northern Pacific it is 6 to 7. Between these two extremes fall the other roads.

* Annual Report of the Public Service Commission of New York, First District, 1911, Volume II, pp. 19–20.

† Annual Report of the Minnesota Railroad Commission, 1913, Minneapolis, 1913, pp. 200–314. Also the Annual Report of the Board of Railroad Commissioners of Iowa, 1911, Des Moines, 1913, pp. 339–413.

This table shows this very clearly—that while a general statement may be made regarding the relation between operating revenue and compensation for the larger Western railroads, no such statement will hold for the ratio between compensation and amount paid in interest and dividends. The latter figure depends largely upon the prosperity of the individual road. Hence the variation is considerable.

This fact is further emphasized by some additional figures showing the ratio between operating income and total interest and dividends. (In none of these cases were the figures for total compensation available.) The Lake Shore and Michigan Southern reports an operating income of $48,452,126; dividends of $9,999,298; and interest of $6,379,832. This would make the ratio between operating income and property income 3 to 1.*. The New York Central, with operating revenue of $100,-741,601, reports the payment of $18,868,966 in property income, a ratio of 5 to 1;† the Pennsylvania, with operating revenue of $157,234,107, reports the payment of $26,096,471 in property income, a ratio of 6 to 1;‡ and the Delaware, Lackawanna, and Western, with an operating revenue of $35,947,066, reports the payment of $6,028,800 in dividends (6 to 1).§

The railroad facts are well authenticated and fairly complete. For all of the leading roads, 44 per cent. of the operating rail revenues is paid for compensation, and 23 per cent. is paid for interest and dividends. The railroads of the United States in 1911 had completed the lines of a well defined picture of income values. Under the then existing arrangements, the owners of railroad property were receiving more than half as much as the people who do the work of the railroads.

The information regarding the other transportation industries is less satisfactory. There were in the United States in 1912, 30,317 telephone systems reporting an annual income of less than $5,000, with 1,228,935 miles of wire and 1,402,844 telephones.‖ The total income of these systems was $255,-

* Annual Report of the Michigan Railroad Commission, 1911, Lansing, 1912, pp. 199–208.

† Annual Report of the Public Service Commission of New York, Second District, 1911, Volume III.

‡ *Idem.* § *Idem.*

‖ Bureau of the Census, Bulletin No. 123, Telephones and Telegraphs, 1912, Washington Government Printing Office, 1914, p. 18.

081,234. Of this total, $96,040,541 was paid out in the form of salaries and wages, $20,163,960 in the form of interest, and $34,120,809 in the form of dividends. The surplus was $17,205,516.* In the telephone business the service income is almost twice as great as the property income.

The land telegraph systems of the United States report for 1912† gross receipts of $52,337,211. Salaries and wages are reported as $23,797,980, interest as $1,608,593, and dividends as $3,139,861. The ratio of service to property income is here about 5 to 1.

The data for express companies collected by the Interstate Commerce Commission show:‡

Operating revenue	$76,198,754
Other income	5,633,792
Total Income	$81,832,546

The total payments for interest were $950,407; for dividends out of current income, $5,928,104; out of surplus, $26,775,727, making a total payment in property income of one third of the total income. The dividend payments out of surplus were swelled by a $24,000,000 dividend paid by the Wells-Fargo Company. The credit balance carried from income to balance sheet was $59,215,601.

The Iowa Railroad Commission furnishes two other classes of instances in which both service and property incomes are available. There are terminal railway companies in Iowa which report the payment of $329,049 in wages and salaries, and $37,553 in interest and dividends.§ The total operating receipts are comparatively small—slightly more than $200,000 from rail operations with additions from rents of various kinds. The ratio between service and property income here is very much higher than that in the case of railroad companies. The Iowa report also contains an analysis of accounts of five

* Bureau of the Census, Bulletin No. 123, Telephones and Telegraphs, 1912, Washington Government Printing Office, 1914, p. 19.

† *Ibid*, p. 25.

‡ Statistics of Express Companies for 1910, Interstate Commerce Commission, Washington Government Printing Office, 1912, p. 15.

§ Annual Report of the Railroad Commissioners of Iowa, *op. cit.*, pp. 483–498.

bridge companies with a total capital of $12,625,800.* The income is derived from rail operations, joint facilities interest, and miscellaneous sources. During 1911, the total compensation paid was $41,443, the total amount of dividends $331,464, and the total amount of interest $87,500. Therefore the ratio of service to property income is 1 to 10. No conclusion can be drawn from these instances. They are inserted here merely because they indicate the extent of the variation which may occur between service and property income.

The transportation business differs from many other businesses. The gross receipts cover the return for service in its various forms, and there is no deduction from them as there is in manufacturing for raw materials. At the same time, the total amount of capital invested per employee is comparatively high, because of the great initial charge involved in railroad construction. Approximately half of the gross receipts of transportation agencies are paid out in the form of service income (wages and salaries). An amount is paid in the form of interest and dividends varying with the industry and the individual establishment.

The Answer for Municipal Utilities.

Another five years of investigation and of compilation by public utilities commissions will bring together data regarding the income from municipal utilities (street car service, gas, electric light, and water) as complete as that which now exists for the railroads. At the present time, the data are fragmentary in character. The Bureau of the Census has compiled, once in five years, a complete series of reports for the electric railways of the United States, showing the operating earnings, and dividends and interest paid, as well as wages and salaries. For 1907, the last of available data, the total operating earnings of the street and electric railways of the United States were $418,887,858.† The amount paid for

* Annual Report of the Railroad Commissioners of Iowa, *op. cit.*, pp. 504–516.

† Street and Electric Railways, 1907, Special Report of the Census, Washington Government Printing Office, 1910, p. 26.

wages and salaries was $150,991,099, while the total amount of dividends was $54,485,274, and the total amount of interest was $71,468,788. From these figures it appears that three eighths of the operating earnings on street and electric railways goes to the payment of service income, and five sixteenths to the payment of property income. The ratio between service income and property income is therefore 6 to 5.

In passing, it may be noted that on the street railway lines the interest charges exceed the dividends—the ratio between the two is 4 to 3. The ratio for all of the railroads of the United States is very similar ($406,000,000 and $291,000,000). In both cases the primary capital outlay is heavy.

A few state reports cover the same ground as that included in the Federal report. The Maine Railroad Commission* reports on the operations of 15 street railways in the state as follows: Total wages and salaries, $1,116,106; total dividends, $228,477; interest, taxes, and other charges, $784,029. Apparently the ratio of service and property income is approximately the same in Maine as for the country at large.

The Public Service Commission of the First District in New York† shows a total compensation of $28,632,580, and a total payment of interest and dividends of $12,204,640. Here the ratio of service to property income is 7 to 3. This ratio is considerably lower than that for the country at large.

One Minnesota street railway (the Minneapolis and St. Paul Company) with operating revenues of $444,504, reports the payment of $170,733 in total yearly compensation, and of $58,445 in interest and dividends. The proportion of service to property income is in this instance almost exactly 3 to 1.‡

The Census Bulletin for 1912 dealing with street and electric railways shows a gross income from all sources of $585,930,517. Payments for wages and salaries equal $200,890,939; the total interest charges were $98,025,338, and the total dividend charges were $51,650,117. The ratio of service to property income was therefore 10 to 7.§

* Annual Report for 1912, *op. cit.*, pp. 10–32.

† Annual Report for 1911, *op. cit.*, Volume II, pp. 133–326.

‡ Annual Report of the Minnesota Railroad Commission, 1911, *op, cit.*

§ Street and Electric Railways, 1912, Bureau of the Census, Bulletin No. 124, Washington Government Printing Office, 191[illegible], p. 66.

A ratio apparently exists between operating revenues, and service and property income on street railways approximately similar to that for steam railroads. As in the case of railroads, there are variations in the ratio between service and property income from one establishment to another. The property income is relatively higher here, however, and the railroad ratio (12 to 7) is exceeded.

The data for other public utilities are far less satisfactory than those available for street and electric railways. For the First District in New York, the total compensation paid by gas companies was $8,894,766, while the total payments of interest and dividends was $10,548,564.* In the same district the electric companies paid $6,663,600 in compensation, and $5,395,654 in interest and dividends. The companies operating both gas and electric franchises in the First District of New York paid a total compensation amounting to $16,850,676, and a total of interest and dividends of $19,443,164. These figures obviously do not justify any general conclusion. The situation in smaller cities and towns may differ considerably. In New York, however, it appears that the payments of property income equal, or even exceed, the payments for service income.

Partial reports from a number of individual gas companies show the ratio between gross earnings, and interest and dividends. These gas companies are, for the most part, in small towns. The ratio runs at 3 to 1, 4 to 1, and 5 to 1.

The Wisconsin Railroad Commission reports on the operating revenues and the payments for interest and dividends of certain public utilities in 1911.† For gas utilities the ratio is 4 to 1; for electric utilities it is 4 to 1.

The relation between service income and property income differs little from that in the railroad industry. There are a few instances in which the payments of property income exceed the payments of service income. In general, however, the conclusions which apply to the railroads are equally effective in the case of public utilities.

* Annual Report of the Public Service Commission, 1911, *op. cit.*, Volume III.

† Annual Report of the Railroad Commission of Wisconsin, 1910–11, Madison, 1912, Volume II, Part IV.

THE ANSWER FOR MANUFACTURING INDUSTRIES.

The manner in which the values created in manufacturing industries are disposed of is far less clear than it is in the case of transportation and of public utilities. The books are similarly kept; the facts could be made as readily accessible, yet to date, there has been little effort to collect and analyze them.

It is interesting in this connection to bear in mind the relation existing between the values derived from transportation and from manufacturing. The railroads in the United States show for 1911 gross earnings of $2,750,000,000. During 1909 the "value added by manufacture" to the raw materials which entered into the manufacturing processes is reported by the census as $8,500,000,000. In other words, the total amount of values created in manufacture is approximately three times as great as the total created in the railroad industry, the figures for railroading being for 1911, and the figures for manufacturing for 1909.

The study of manufacture which was made in connection with the Twelfth Census (1900) contained the most complete statement available of the relation between service and property income in the manufacturing industries. There were 185 industrial combinations covered in the census investigations. The capital invested in these combinations was $3,093,095,868, the item for wages and salaries was $227,861,188, and the item for interest and dividends was $135,126,612. The ratio of service to property income is in this case 5 to 3.*

The only accurate up-to-date information on the relation between service and property income is that contained in a few scattered reports on individual industries. These figures are necessarily indicative rather than conclusive.

Three important companies engaged in the manufacture of iron and steel make reports which permit of analysis into service and property income. The Bethlehem Steel Corporation in its report for 1913 † shows the payment of $4,374,653 in interest and dividends, and $13, 993,417 in wages and salaries. At the same time, $7,500,000 was set aside for additions to

* Census of Manufacturers, 1900, Part II, pp. lxxvi–lxxix.

† Ninth Annual Report of the Bethelehem Steel Corporation for year ending December 31, 1913.

property and working capital, and the net earnings were $8,750,000, of which $1,528,785 was applied for depreciation, and $2,214,517 appeared as surplus. The amount paid in service income is three times as great as the amount paid in property income, but the amount of interest and dividends, plus the amount set aside for additions to capital, plus the balance, is almost exactly equal to the amount paid for services.

The earnings of the United States Steel Corporation and of the Republic Iron and Steel Company were analyzed in great detail in the recent Federal Report on the Steel Industry.* For 1911, the total receipts of the United States Steel Corporation from all sources were $618,911,430. Of this amount, 23 per cent. was paid out for wages and salaries, 16 per cent. was paid out as interest and dividends, and 5 per cent. was set aside as surplus. The ratio of service to property income is therefore 3 to 2. Unfortunately the interest charge includes depreciation, replacement, and sinking funds. In this connection it is interesting to note that in 1911, while $161,419,000 was paid in wages and salaries, the undivided surplus of the steel corporation was $156,275,000, an amount almost equal to the total paid in wages and salaries during that year.†

The Republic Iron and Steel Company for 1911, with total receipts of $24,680,288, charged 30 per cent. to wages and salaries, 11 per cent. to dividends and interest (including depreciation and interest charges), and had a surplus of 5 per cent. of the total receipts.‡ The ratio of service to property income is here 3 to 1.

The material giving directly the amount paid by manufacturing industries in service and in property income is meager in the extreme. There are, however, two sources from which some information on the subject may be gleaned. On the other hand, the census data on manufacture give for all industries and for specific industries the total value of products and the total payments for wages and salaries. These figures show the relation between gross value, or value added by manufacture, and service income. Several states publish like data.

* Report on Conditions of Employment in the Iron and Steel Industry, United States Bureau of Labor, 1912, Washington Government Printing Office, 1913.

† Report on Conditions of Employment in the Iron and Steel Industry, *op. cit.*, p. 277.

‡ *Ibid*, p. 279.

On the other hand, a body of information exists in those corporation reports which gives gross income and total payments for interest and dividends. From these figures total property income may be ascertained. The two sets of figures certainly cannot be compared. Both, however, are suggestive.

The general census tables contain but a partial analysis of the disposition of the values derived from manufacturing. They report the values added by manufacture (the gross value or selling value of the materials minus the cost of the raw material), and the wages and the salaries. It is thus possible to show what part of the values derived from manufacturing was paid out in the form of service income. There is nothing in the census figures for 1910 that gives any clue to property income.

The value of all products produced by manufacturing industries in 1909 was $20,750,000,000.* The value added by manufacture was $8,572,527,000. The total amount charged against "services" (a term under which the census includes all salaries and wages) was $4,375,000. Thus almost exactly half of the value added by manufacture was paid out in the form of salaries and wages. The reader will remember, by way of comparison, that slightly less than half of the operating rail revenues of railroads was paid out as service income.

The ratio between value added by manufacture and total payment for services is not at all uniform in the different manufacturing industries. Indeed, the variation is many times greater than that shown by the statistics of railroads. While the ratio is 2 to 1, in the manufacturing industries at large, it stands 33 to 1 in the manufacture of distilled liquors, and 20 to 19 in the case of general shop construction by railroad companies. A table of the 35 industries in which the value of the products for 1909 is reported to exceed $75,000,000, shows that for the most part the relation between the value added by manufacture and the total amount paid for services remains fairly constant, varying between 5 to 2 and 5 to 3. In this entire group of industries there are six instances in which less than two fifths of the value added by manufacture is paid out in the form of service income, and five instances in which more

* Abstract of the Thirteenth Census of the United States, p. 436.

than three fifths of the value added by manufacture is paid out in the form of service income.

There are a number of state bureaus of labor which publish information regarding the total receipts from manufacturing, the cost of materials and supplies, and the total amount of wages paid. Unfortunately, there are no instances in which the states report the amount of salaries as well as the amount of wages. The information available in the state sources must therefore be regarded as of distinctly inferior value to that in the Federal Census.

The state of Oklahoma furnishes information regarding its manufacturing industries for 1911.* During that year, the total receipts from the sale of manufactured products were $81,857,148. The figures in this report show that the cost of materials used in the manufacturing industries of Oklahoma is five eighths of the total value of the products. This proportion is the same as that shown by the United States Census figures. Of the value added by manufacture, 45 per cent. was paid in wages. If salaries had been included in this statement (they usually amount to about 5 per cent. of the value added by manufacture), the ratio of value added by manufacture to service income would be virtually the same as that reported by the United States Census.

New Jersey and Massachusetts publish statistics showing the value added by manufacture and payments in the form of wages. The figures for Massachusetts vary somewhat from those of Oklahoma.† The Massachusetts industries are primarily textile. The wages paid in these textile industries are lower, and a smaller proportion of the value added by manufacture is paid to the wage-earners. An analysis of the figures published by the New Jersey Bureau of Statistics‡ shows a situation which differs very little from that recorded in the United States Census and in the Oklahoma report. On the whole, it may be fairly said that the state reports do not differ in any material way from the figures published by the latest Federal Census.

* Annual Report of the Department of Labor, Oklahoma, 1911–12, Oklahoma City, pp. 150–153.

† Twenty-fifth Annual Report of the Statistics of Manufacturers, 1910, Bureau of Statistics, Boston, 1912, pp. 2–12.

‡ Bureau of Statistics of New Jersey, 1911, Camden, 1912, pp. 10–26.

A generalization is permissible at this point. It seems to be true that about one half of the value added to the raw materials by the American manufacturing industries is paid out as wages and salaries, while those with a comparatively small capital investment report a far larger proportion. Although the generalization does not hold true for specific industries, it does seem to be borne out by the results obtained by state as well as Federal studies.

The figures showing the relation between gross values or total values created in the manufacturing industries, and the payments for service income, are far less usable from a statistical standpoint than the figures showing value added by manufacture. The immense difference in the net value of raw materials leads to wide differences in the ratio of gross values to service income. The total figures from the census shows that of the gross value created in manufacture, the amount paid in wages and salaries constitutes about one fifth for all industries. This proportion seems to be a representative one.

However desirable it might be to reject these figures for gross values and adhere to the values added by manufacture, the manner in which most industrial accounts are kept do not permit of any such procedure. If service and property incomes in the manufacturing industries are to be compared, attention must center on gross returns, because that is the only figure which appears in corporation accounts. Even that is absent from most accounts, or else a complication of accounting prevents the student from determining the amount of interest or of dividends. There are a number of manufacturing industries, however, for which the manuals publish fairly satisfactory data.

One of the most frequently discussed companies is the Pullman Company. This company, with a capital of $120,000,000 (no funded debt) reports for 1912–13 total revenues from all sources:—

Sleeping car operations	$40,103,216
Auxiliary operations	1,091,875
Manufacturing plant	31,320,181
	$72,415,272
Net corporate income	14,714,704
Dividends, 1912–13	9,439,769

Apparently (for the accounts are not entirely clear) the ratio between total revenues and the amount paid in dividends is 8 to 1, while the ratio between total revenue and the amount of net corporate income is 5 to 1. In this connection, it is worth remembering that although the amount paid in dividends by the Pullman Company is only one eighth of the gross revenues, the Pullman Company has increased its capital from $18,000,000 to $120,000,000 by declaring stock dividends.* Nowhere is there adequate statement to show the proportion of gross earnings which the Pullman Company pays in service income.

The ratio between gross earnings, the amount paid in interest and dividend, and the amount set aside as surplus by certain companies which make fairly complete reports, appears in the following table:

TABLE IV.

RATIO OF GROSS INCOME TO PROPERTY INCOME AND TO SURPLUS IN CERTAIN REPRESENTATIVE INDUSTRIES.

Companies.	Year.	Ratio of Gross Income to	
		Interest and Dividends.	Amount set Aside as Surplus.
American Locomotive Company	1910–11	30 to 1	25 to 1
American Woolen Company	1909	20 to 1	25 to 1
Baldwin Locomotive Works	1912	12 to 1	16 to 1
Dupont Manufacturing Company	1912	7 to 1	20 to 1
General Baking Company	1912	16 to 1	50 to 1
General Electric Company	1911	11 to 1	14 to 1
International Paper Company	1910–11	16 to 1	30 to 1
National Biscuit Company	1910	12 to 1	3 to 1
Pittsburgh Plate Glass Company	1911–12	11 to 1	50 to 1

There are a few smaller companies for which the figures are available. These cases, most of them among the successful large manufacturing concerns, illustrate the extent of the

* The Manual of Statistics, New York Manual of Statistics Company, 1913, p. 735.

variation and the general ratio existing between gross income and property income. Apparently from 5 to 10 per cent. of the gross income of such companies goes for the payment of interest and dividends. It will be remembered that for all manufacturing industries the percentages paid in service income was about 20 per cent.

The student will note with keen disappointment the lack of adequate data on which to base any general statement of the ratio between service and property incomes in the manufacturing industries. That the figures are as readily obtainable for the larger manufacturing industries as they are for the railroads and other public utilities goes without saying. They cannot be worked out and satisfactorily presented until a thorough expert study is undertaken by some official body. Probably real enlightenment in this direction lies in the creation of a commission with powers like those of the Interstate Commerce Commission, to compel the keeping of uniform accounts.

For the time being this much may be said. Half of the total value added to the raw material by the processes of manufacture is paid out in the form of service income. The proportion paid in property income is less, very much less, in fact, although no defensible statement may be made in terms of figures. Of the gross income from manufacturing industries, a fifth is paid out in the form of service income, and a considerably less proportion takes the form of property income.

Mining, Smelting, and Refining.

Perhaps the Michigan Copper strike revealed a unique example of the relation between service and property income. At the same time, the strike resulted in the publication of some significant facts regarding the income situation in the copper mining industry, and showed that certain of the properties were yielding immense returns on the capital invested.

The full text of an illuminating report* throws into the foreground the operations of the Calumet and Hecla Company, and the companies which it controls. The actual cash

* Michigan Copper District Strike, United States Bureau of Labor, Bulletin 139, Washington Government Printing Office, 1914.

paid into this company seems to have been $12 per share on 100,000 shares, the par value of which is $25. The Calumet and Hecla Company reports for 1912 $4,364,360 paid in the form of interest and dividends, and $3,193,073 paid in wages. Exactly what percentage of the total compensation this term "wages" includes, the report does not make clear. If the ordinary relation between wages and salaries exists, about 5 per cent.* should be added to this amount in order that the total amount paid in the form of service income may be ascertained. The amount of interest and dividends is considerably in excess of the total amount paid in wages and salaries.

An examination of appendices 2 and 3 in the same report shows that while the Calumet and Hecla Company is the largest and apparently by far the most successful of the companies reporting, there are other ventures almost equally successful. The ratio of service to property income in the case of the Calumet and Hecla Company is probably unique. At the same time, it is one instance, on a huge scale, of an industry which pays more dollars per year, to the holders of the property than to the people who carry on the work.

The figures showing the relation between service and property incomes in the mining industry are far from satisfactory. The figures published in the Thirteenth Census† show a total value of the production of mines and quarries of $1,238,410,000. The expenses of operation and development were $1,042,634,000. This total includes the expenditures for services, supplies, royalites, taxes, contract work, rents of offices, and the like. Apparently all of the costs of the business are included except the payment for interest and the fund for dividends and surplus. Although it would seem that the $200,000,000 of difference between value of products and expenses of operation represents property income, surplus, depreciation and insurance, such an inference is wholly unsupported, and may be unjustified.

The census does make clear the relation between the value of products and the costs of operation, on the one hand, and

* Abstract of the Thirteenth Census. Table 110, pp. 514 ff.

† Mines and Quarries, 1909, Bureau of the Census, Washington Government Printing Office, 1913, pp. 334-335.

the payment for services on the other. The total expense for services was $662,422,000, or about one half of the value added to products and three fifths of the total cost of operation. Among the principal mining industries the proportion of total value of products to service income is about 2 to 1. It is highest in bituminous coal mining (4 to 3), and lowest in the production of petroleum and natural gas (5 to 1). For the most part, the ratio holds fairly constant.

The census report on Mines and Quarries for 1902* contained an analysis for all incorporated companies showing the total amount paid in wages and salaries, and the total amount paid in interest and dividends. The value of products for 1902 was $796,826,417; the total of wages and salaries was $354,079,000 and the total of interest and dividends was $86,021,000.† The ratio between total value produced and service income was therefore about 2 to 1, and between total value and property income, 9 to 1.

Such fragmentary information in the mining industry as may be gathered from the manual of industrial statistics shows that the variation between total earnings and property income is extreme. Few of the mining companies making reports have funded debts. They are, for the most part, capitalized by the issue of stock, on which the dividends vary widely.

Service and Property Incomes.

Any one who sets out to find for service and property income a fixed rate which will hold true among all industries, or that will hold true throughout any one industry, is doomed to bitter disappointment. No such ratio exists, and in the very nature of things, it cannot exist. Variations in the conduct of individual businesses, and in the character of various classes of businesses, necessarily lead to variations in the service—property income ratio.

A fixed formula between service and property income is not in any sense indispensable, however convenient it may be. The important fact lies in the existence of a demonstrable relation between service and property incomes.

* Special Report of the Census Bureau, Washington Government Printing Office, 1905.
† *Ibid.* pp. 68 and 88.

The business accounts of today give no clue to "rent, interest, wages, and profits." In so far as modern accounting is concerned, the terms as they were used by nineteenth century economists are obsolete. In their place appears a new terminology including such words as "compensation," "dividends," "interest," and "surplus." Compensation is service income; dividends and interest are property income; surplus is undistributed income, or income the distribution of which has not yet been determined. If the economists is to talk in terms that the man on the street can understand, he will have a distinction between service and property income that is clear-cut and logical, on the one hand, and which, on the other hand, is being constantly more definitely formulated and lived up to by the world of affairs.

The data for distinguishing service from property income are as yet incomplete. Yet the logic of the distinction seems no less inevitable than the trend of fact in that direction. As the material aggregates it will become more and more clear that the income issues of the next generation must concern themselves with incomes from services, on the one hand, and incomes from property on the other. The distinction is vital, and it takes added significance with each passing year.

REVIEWS AND NOTES.

ANNUAL STATISTICAL REPORT OF THE BOSTON CHAMBER OF COMMERCE—1913.

Commercial organizations in the larger cities are more and more seeking out and advertising every commercial and industrial advantage which their city affords. To do this intelligently and comprehensively statistics showing the city's activities are necessary, and trade bodies are making it a practice to publish such figures. One of the most recent and complete publications of this nature is the Annual Statistical Report of the Boston Chamber of Commerce, 1913.

This report is a neatly bound volume of about 100 pages and although the tables are not numbered, making reference to them difficult, their well-arranged headings and rulings add to the clearness of the book.

Statistical exhibits of three general classes appear in this report. Approximately one third of the material is devoted to a presentation of the facilities for, and the extent of sea-going trade through the Port of Boston, or the District of Massachusetts as it is henceforth to be called. A second short section contains tables showing bank clearings, property valuations, railroad operations, etc. The remainder of the book is given over to tabular material presenting the volume, price, and movement of produce, meats, and similar commodities in the Boston market.

The material is largely assembled from other reports rather than being an original compilation and is of the character commonly presented in the statistical reports of such bodies. As far as the inclusion of material is concerned, the report covers the field in a fairly thorough manner. Nevertheless, like so many similar publications, the book seems to have suffered somewhat from lack of organization and point.

The data describing the activities of Boston as a shipping centre are of especial interest at present since Boston is fully awake to her port development and the growth of foreign trade through that district. This material, however, would be of greater value if it included the corresponding figures for other leading ports, as well as for the United States as a whole. Only by the inclusion of such a background, against which to measure the present status of the port, can the trend and the comparative volume of its trade be shown. As a single illustration, importations of mahogany have fallen off enormously in that district in recent years and yet the report does not show whether there has been a similiar decline in importations of this commodity at other Atlantic ports.

Again, Boston's position as a world port would be more clearly shown if the foreign countries with which she exchanges commodities were given in the list of "Imports and Exports from Boston in Detail." This would also add value to the list for persons interested in specific commodities.

In connection with such a rapidly-growing port, information in regard to its physical equipment might well be added. In this connection the length of the waterfront, increasing wharfage, etc., would be of interest.

The three or four pages showing financial and similar data would seem to be capable of enlargement. For example, assessed property valuations are shown over a series of years. The value of this material would be increased if this table were modified so as to show Boston's total assessed valuation, together with corresponding figures for other cities of the first-class, and all valuations reduced to a uniform basis by applying to each total the percentage of assessed to actual value. Such a table would be indicative of the city's comparative growth in wealth and would be especially interesting since the report omits a statement of the volume of the building permits issued by the city.

A far more serious lack is the entire omission of industrial data, notwithstanding the fact that Boston is one of the largest manufacturing centres in the country.

Finally, textual analysis is nowhere attempted. General summary statements, calling attention to the development and progress of the city, as brought out in the tables, would add to the value of this report and of all reports of this nature.

WILLIAM H. MAHONEY.

IN MEMORIAM.

We regretfully record the death of two honorary members of the Association. Dr. Robert Meyer, of Austria, died on the 10th of June of this year, and Dr. Archibald Blue, of Canada, on July 27.

Dr. Meyer was a Privy Councillor and at one time Minister of Finance for Austria; president of the Central Statistical Commission; honorary professor of the Imperial University of Vienna; vice-president of the staatswissen-schaftliche Staats-Prüfungskommission and vice-president of the International Statistical Institute, etc. His influence on the statistical work of Austria and her dependencies was of lasting value. The memorial volumes published in celebration of the Fiftieth Anniversary of the Central Statistical Commission of Austria last year owe their excellence largely to him. He personally contributed some notable articles, among them one defining the relation between mathematics and statistics. Probably one of his latest undertakings was an article on the development and progress of statistical work in Austria, prepared for the memorial volume of this Association. Dr. Meyer was an altogether notable personage in Austrian life and will be greatly missed.

From the *Census and Statistics Monthly* for the Dominion of Canada we append the following sketch of Dr. Blue's life and activities:

"Dr. Blue was born on February 3, 1840, in the township of Orford, County Kent, Ontario, his father, a Gaelic Scotsman who died a centenarian, having come to Canada from Lochilhead, Argyllshire. Mr. Blue,

after experience as a school-teacher, entered journalism, serving successively on the editorial staffs of the *St. Thomas Journal* (1867–1879), the *Toronto Globe* (1879–1880) and the *Toronto World* (1880–1881).

"In 1881 Mr. Blue organized the Ontario Bureau of Industries of which he was Secretary from 1882 to 1891. In this capacity he instituted the useful agricultural statistics and crop reports of the Ontario Department of Agriculture, preparing for nine years the annual reports thereon. From 1884 to 1891 he was Deputy Minister of the Ontario Department of Agriculture and from 1891 to 1900 Director of the Ontario Bureau of Mines. Appointed in 1900 by the Hon. Sydney Fisher, then Canadian Minister of Agriculture, as Chief Census Commissioner, Mr. Blue conducted the Fourth Census of Canada in 1901 and wrote the elaborate introductions to the reports of that Census on natural products and manufactures. On the organization of the present Census and Statistics Office in 1905, Mr. Blue was appointed Chief Officer, and the Northwest Census of 1906, as well as the Fifth Census of 1911, were carried out under his general direction. In 1908 he instituted the present system of agricultural crop-reporting for the Dominion and started the Census and Statistics Monthly.

"In 1888 Mr. Blue served as a member of a Commission appointed to inquire into the mineral resources of Ontario, and he was a delegate to the Deep Waterways Convention of 1894. In 1908 he was elected as an Honorary LL.D. of McMaster University at Toronto; and he was a representative of Canada at the General Assembly of the International Agricultural Institute, held at Rome, Italy, in December, 1909, when he presented the paper on Crop-Reporting in Canada which was published in the *Census Monthly* of February, 1910. In February of the present year he was elected as an Honorary Member of the American Statistical Association on the occasion of the celebration of its Seventy-fifth Anniversary.

"Wielding a vigorous and facile pen, Dr. Blue, during a long, strenuous, and useful career as public servant, was the author of numerous articles ranging over statistical and economic subjects, whilst his genial and unassuming disposition secured for him widespread friendship and esteem."

J. K.

THE AGRICULTURAL CENSUS OF 1910.

The last census is the result of the greatest expenditure of money, and the employment of the greatest number of scientific experts thus far devoted to any one statistical inquiry in the country. It has been called "a college man's census." The director was a man of scientific training and years of scientific experience. One of the first moves of the director after assuming his new duties was the calling together of experts to aid in determining the plans and scope of the census and the formulation of the schedules to be used by the enumerations. The wisdom of this method of procedure can hardly be called in question, yet the conservatism lurking in a government bureau, even under a new director, is such that innovations are with difficulty inaugurated. In this case a very large part of the good

advice of the experts was rejected at the last moment and the schedules put back into the forms agreeable to a few men not too familiar with the facts of agriculture.

In the main the agricultural schedule of 1910 is very similar to that of 1900 but materially more elaborate. This further elaboration of preceding schedules has long been in progress. For example, a maximum of forty-eight questions were asked of each farmer in the census of 1860, and twice that number sufficed for the "Domesday" inquiry of 1880. In 1900 a total of 306 questions were included in the schedule, while in 1910 the number had grown to 560. That this latter number is too great is the belief of substantially everyone from director down to enumerator concerned in the census work. Nevertheless, the information asked for is, almost without exception, of much value. The difficulty was to get it, for even with the most painstaking care in the matter of instructions to enumerators many of them failed to comprehend what was wanted. Worse yet, many farmers felt that it was an imposition to ask them to answer in such minute detail questions on which they had little accurate information. For instance, a farmer was usually interested in reporting the acreages of grain and hay, the yields of the same, the number and value of livestock, but he was likely to lose interest, and incidentally faith in the census, when asked to report on the quantity and value of vegetables raised in his kitchen garden.

Back of the work of the Census Bureau in taking the census are several matters over which Congress has control and which need attention. The weakest factor in the whole census group is the enumerator. Here is work requiring expert knowledge and experience to be done by a vast army of inexperienced people, employed for a single month, at a wage not attractive to responsible and capable workers in any but exceptional cases. This difficulty can probably not readily be remedied so long as we continue to take the census within a given month during the spring or early summer. On the other hand there is in each congressional district a "supervisor of the census" who has it within his power to correct many of the evils due to the shortcomings of the enumerator. This supervisor is, due to the exegencies of politics, not appointed by the director of the census. He is virtually appointed by the congressman from the district. This precludes, in the great majority of cases, the possibility of expert supervision. As a result, a great many errors which could quite readily be checked up and eliminated by a competent supervisor, pass on to the Census office where correction is more difficult and in many cases impossible.

Another matter over which Congress has control is that of the time of year for taking the census. Surely the change from June 1 to April 15 was not made in the interest of agriculture however favorable it may be for other branches of the work. With respect to crops of the preceding year, the change made little difference; for the question as to crop acreages for the census year April is distinctly less favorable than June. However, it is in the very important matter of livestock that the worst results are to be noted. One of the main values of census figures is for comparisons

which are made possible, comparisons of like facts for different dates. The status of the livestock situation on April 15 is essentially unlike that of June 1. During this period, within a large part of the country, the greater number of young are born. Moreover, the number of colts, calves, and pigs raised during a given year shows as nothing else can the status of the livestock industry with respect to future prospects. These facts are wanting and the value of the thirteenth census in much less than it otherwise would be. Every friend of the argicultural census work should exert his influence to have the time of the census taking changed once more. The most favorable time would undoubtedly be after the work for the year is substantially over and before the occupier of the farm has moved to his next holding. Over one sixth of the American farmers move each year, and it is difficult, often impossible, to get statistics for the farm after the farmer has moved away. Taking the census in the early winter would give the best possible results as to crops grown, animals raised, land tenure, farm mortgages—in short, for substantially the entire schedule.

Congress played a poor rôle in the management of the census finances during 1910 to 1912. A fairly liberal appropriation was made for the taking of the census. However, some important stipulations were made necessitating unusually large expenditures. The work went on, and the expiring congress saw that more money was to be needed in order that the vast amount of information contained on the schedules might be made available. However, it was decided that money enough for the time intervening between that time and the meeting of the next congress was all that was imperatively needed. The next congress was of a different political complexion and indisposed to show much consideration for the unfinished work of its predecessor. Hence the census was left stranded between two ports either of which would have been welcome and either of which should have offered the required help. Trained clerks were discharged and work under way was abandoned. As a result, money was ultimately wasted, and some of the most interesting and valuable of the statistics are aging on the census shelves.

In spite of all discouragements and mistakes the agricultural census of 1910 is the best yet published. It contains the most information, and by all means presents it in the most available shape. The general report is confined to one volume. In this is to be found the leading facts classified under twelve headings, viz: Farms and Farm Property, Farm Tenure, Farm Mortgages, Statistics of Farms by Race Nativity and Tenure, Size of Farms, Livestock on Farms and Elsewhere, Livestock Products and Domestic Animals Sold or Slaughtered on Farms, Summary for All Crops, Individual Crops, Agricultural Statistics by Counties, Irrigation, Plantations in the South. An appendix treats of the physical features and soils of the United States. With the exception of one chapter the facts are presented by states only. In the chapter giving county figures the statistics of several preceding chapters are shown, the difference being in the matter of detail. The tables in this volume are a distinct improvement over similar tables in former volumes. In addition to text and tables an

elaborate series of maps is presented showing the geographical distribution of substantially every species of farm property and product.

The more detailed information is published in two volumes made up of state bulletins. These volumes are very usable. The state is accurately described as to soil; the leading statistics are presented in a series of small state tables accompanied by suitable text; detailed statistics are given by counties. So far as possible comparative figures from preceding censuses are given in the state tables. All in all it will be less frequently necessary to turn from one census report to another in making comparisons than has heretofore been the case.

A unique feature of the publications is the combining of each of the state bulletins with the Statistical Abstract of the whole census for use in the respective states. This gives to a great number of people all the information desired and saves sending out the complete volumes where this combination serves the purpose as well or better.

Statistics according to age of farmer; much information concerning rented farms; and the same for mortgaged farms are three items of importance on which the census bureau still has the unpublished facts. These are facts which should be made available, no doubt they will be, but the longer they are in appearing the less will be their value.

It is to be hoped that a more satisfactory and less expensive method of gathering agricultural statistics may be devised. Making use of the rural mail carriers has been suggested, and the suggestion merits consideration. It may be found feasible to specialize, as it were, with respect to inquiries made at a given time, putting the emphasis on one subject at one census and on something different at another. There is good reason to believe that our agricultural census figures are reasonably reliable. What is needed is greater facility in gathering them, and much greater speed in preparing them for use.

B. H. Hibbard.

University of Wisconsin.

THIRTEENTH CENSUS OF THE UNITED STATES—MANUFACTURES, 1910.

Volumes VIII, IX, X, Census Office, Washington, D. C.

The statistics of Manufacturers for the Thirteenth Census of the United States constitute three of the twelve volumes (including the Abstract) of the Report. Volume VIII is entitled "General Report and Analysis"; Volume IX, "Reports by States, with Statistics for Principal Cities"; and Volume X, "Reports for Principal Industries." Volumes IX and X contain essentially the same data that are found in Volume VIII, but treated in more detail, and arranged either primarily by states and cities, or by industries.

The data presented were collected for the most part by special agents appointed for that purpose. In remote districts the population enumera-

tors either aided in the collection or completely collected the data asked for on the General Schedule. The questions asked relate to a few fundamental facts. All "establishments" returned the General Schedule, while in the case of some sixty-two industries, special or supplementary questionaires were used.

For the most part, the questions asked in this Census are comparable to those asked in the 1900 Regular Census, and in the Special Census of 1904. The 1909 Census, like that of 1904, was "confined to manufacturing establishments conducted under what is known as the factory system, exclusive of the so-called neighborhood, household, and hand industries." The Twelfth (1900), and preceding censuses were not so restricted, but in the Report under discussion the statistics for 1899 (1900 Census) were revised so as to exclude the establishments which would not have been canvassed under the instructions for the later censuses.

In two important respects the scope of the Census of 1909 differed from that of the Census of 1904. In 1909, reports were secured for all flour and feed mills, grist mills, and saw mills (omitting those with products valued at less than five hundred dollars in 1909), including even those grinding or sawing for a fixed charge, and not owning the materials and products. The latter—the "custom mills"—were not canvassed in 1904. The Census of 1909 also included statistics of steam laundries.

In 1904, 339 industrial groupings were used; in 1909, 264—a reduction of 75 industrial classes having been effected. In each case the governing condition in industrial grouping is the "product of chief value" (Vol. VIII, p. 37), but by this means too great emphasis is given to some industries, and not enough to others, when a certain product is put out as a by-product, but the industry producing it is classified otherwise because of the main product. Industry totals do not, therefore, give an accurate index of the relative importance of the industries. Changes in the relative amount of various products, and their values, make it necessary to classify establishments differently at different censuses, and thus impair strict comparability. The dangers and problems accompanying this phase of the subject are adequately treated in Volume VIII, pages 37 to 39, while the complete industrial classifications and the changes made in them in 1909, as contrasted with 1904, are given in full in Appendix D, pages 819 to 832, of the same volume.

In no prior census have we been furnished with the figures of "Value Added to Materials by Manufacture." It is evident that no manufacturing establishment, as such, produces the "whole of any commodity." The materials used come to it from various sources, and in all stages of manufacture. The only method, maintains the Census, of measuring the economic importance of the manufacturing process, is by determining the added utility, or money value, of the materials transformed in the process. The value is "in most cases, substantially the difference between the cost of the materials and the value of the products" (Vol. VIII, p. 23), and the statistics shown are, "in each case," this difference. Such figures are "particularly valuable because they are almost entirely free from the dupli-

cation that appears in the total value of products" (Vol. VIII, p. 23). The duplication possible is with "contract work," and constitutes 2.1 per cent. of the value added by manufacture (Vol. VIII, p. 24).

A new inquiry, specified in the Census law, is the number of stockholders. Provision is made for this fact in question 1, but the data collected are not published, and justly so, since number has no significance without the amount and character of the respective holdings. Such inquiries, of course, have no place in a general manufacturing census.

As contrasted with the Census of 1904 and 1899, which sought to ascertain the number of persons employed at different rates of pay, and to segregate the amounts paid to men, women, and children employed as wage-earners, the Census of 1909 asked merely for the aggregate amount paid to each of the following classes: salaried officers of corporations; superintendents and managers; clerks, stenographers, salesmen, and other salaried employees; and wage-earners, including pieceworkers. Fortunately we are relieved in this Census from having computed for us, and injected into the discussion, all references to an average wage.

The inquiry relating to number of persons engaged in manufacturing industries was simplified in the 1909 census. Sex composition was required for salaried employees, and sex and age—sixteen years of age and over, and under sixteen—for wage-earners, including pieceworkers. The numbers, in both cases, were to be reported as per pay-roll on the fifteenth day of December, 1909, or the nearest available date. In 1904, the greatest and least numbers employed at any time during the year, by sex and age—men and women separately, sixteen years of age and over, and children under sixteen years without respect to sex composition—were required. Moreover, the schedule called for the average number by months, and by sex and age. Briefly, the difference is between those actually employed on a certain date, as taken from the pay-roll, and the greatest and least number employed at any time by sex and age, distinction being made by sex for those under sixteen years of age, in 1909. In 1909, the actual number of wage-earners on the fifteenth day of each month, as per pay-roll, without respect to sex or age, is required, while in 1904 the question called for the average number of wage-earners employed during each month, classified by sex and age. In spite of these differences, "It is believed . . . that the figures for three censuses (1909, 1904, 1899) are substantially comparable in a great majority of the cases" (Vol. VIII, p. 276). Especially is this held to be true when the statistics relate to large numbers, as for example, to industries as a whole, or to state totals.

The sex and age composition of the wage-earners by months for the 1909 Census is computed as follows, from the sex and age composition for December 15, 1909: " . . . The per cent. distribution by sex and age of the wage-earners in each industry for December 15, or the nearest representative day, has been calculated from the actual numbers reported for that day. This percentage has been applied for the average number of all wage-earners for the year in that industry, and thus an estimate of the average number of men, women, and children employed during the year

has been obtained. These calculated averages for the several industries in each state have been added to give the average distribution for the state as a whole, and the sum of these averages for the several states has been used to determine the sex and age distribution of persons engaged in manufacturing industries for the country as a whole" (Vol. VIII, p. 238).

The average number employed during the year is interpreted to mean the number that it would be necessary to employ throughout the whole year to turn out the value of product actually produced. Accordingly the wage-earners reported for each month are added together and the sum divided by twelve. In this respect the statistical methods for 1904 and 1909 are comparable.

In summary, the facts for each establishment available for presentation relate to location and character of organization, time in operation, capital employed, persons employed, both salaried and wage-paid, materials used, miscellaneous expenses, value of product, power employed, and fuel used. There is almost no limit to which the facts recorded under these various captions, for a country as large as ours and with such diversified industries, can be classified. Obviously, however, intricacy and detail of presentation can only be justified statistically when the data are either fairly accurate or typical, or are affected by errors which tend to compensate each other. Political considerations may prompt intensive allocation of capital employed, wages paid, value of product created, etc., by political jurisdictions, by industries, by size of establishments measured by various standards, but the query must always remain to one who has serious interest in the use of such data and an appreciation of their limitations, as to the propriety of this refinement, from the points of view of both cost and purpose. "Capital employed" is a dangerous statistical unit, both for absolute and comparative purposes, even when carefully measured; gratuitously furnished, with little or no opportunity for verification even within the widest margins, save those which are evident on the face of the census returns, its tabulation in detail is without statistical warrant. No one is more convinced of the limitations of this unit than the Census office, yet seemingly because of political necessity, not only is the capital employed required to be reported, but it is tabulated in the greatest detail, made a cardinal factor in industrial ranking, at the same time that there is printed page after page of conclusive and unmistakable declarations that it is not relatively or absolutely worth the paper upon which it is printed. The Census office, in text analysis, never loses an opportunity to counsel against any weight being assigned to the concept. The only regret is that each column where it appears is not marked with an asterisk, and the following note appended: "These data are meaningless: They are collected and printed only because the law requires it." Consistency as between text and statistical tables would demand some such insertion.

The same considerations, and with equal force, apply to data on "Value of Product." The figures printed have little if any statistical worth, either for one industry or for combined industries. The duplications of value are frequently and unmistakably pointed out by the Census office,

and cautions against the use of the data in any definite or specific sense are found throughout the Reports under review. In spite of this fact, by legislative mandate, the data are collected, and, seemingly, by political necessity, the totals in divided, subdivided, and dissected form are strewn throughout almost every page, giving the value of product to the nearest dollar, for instance, for combs and hairpins (Vol. VIII, p. 485), hones and whetstones, in Indiana (Vol. VIII, p. 721), etc. The data are elaborately tabulated by states by industries (Vol. VIII, General Table VI), by industries by states (Vol. VIII, General Table V), by summaries for states (Vol. VIII, General Table IV), etc., etc. From a statistical viewpoint this is hardly less than farcical.

Moreover, considerable importance is ascribed by the Census to the unit "Value Added by Manufacture," since the amount of duplication as between establishments and industries is largely eliminated. And yet this item is computed as the difference between the value of the product and the cost of materials used, against the use of which justified warnings are constantly urged. It is not clear how such sanctity may characterize the offspring of such contaminated parents. We do not have a condition here where error tends to correct itself, but rather where it becomes cumulative. Neither is this a case where an essentially correct idea may follow from data in and of themselves misleading. Neither of these statistical truths control. The regrettable thing is that legislative injunction requires the collection of this type of data, and that political pressure seems to demand their detailed tabulation. What is said respecting capital, value of product, and cost of material, is directed against the method and circumstances of collection, rather than against the desirability of the data if correctly determined. Such statistics *per se* would be harmless if they were used understandingly. Unfortunately they are not, and the cautions strewn throughout the text—which only the discriminating see—do not avail to prevent false conclusions from being drawn from them. Pressure of time, lack of money, the method of collection, and the uses to which they are put, all combine to make the wisdom of their publication highly questionable. So long as the law requires their collection, it might be argued that their possession justifies publication. Such conclusion does not necessarily follow— at any rate, publication in the present form. Our criticism is directed both to the collection and elaborate tabulation of meaningless and, for all scientific purposes, useless data. If the legislature will not relieve us from collecting them, the limited discretion given the Census office in the matter of publication should be directed toward lessening the necessary evil of detailed publication.

Much the same line of criticism might be extended to the captions, "Cost of Materials," and "Power Used." The space allowed for this review will not permit of an extended treatment of these items.

As for the other inquiries, they primarily relate to matters which may be enumerated, and in which the motives to under—or over—evaluate, or to wilfully misstate, are not controlling. Difficult as is the formulation of a definition of an "establishment," the basis for classification is in the dis-

cretion of the Census office, and the lack of comparability may be reduced to a minimum.

Collection of data on wages and salaries paid does not offer insurmountable obstacles. The Census office undoubtedly has acted wisely in protesting against the use of wages paid to measure the proportion of value of product which goes to this factor, and against the practice of making direct or indirect comparisons of the relative amounts paid in wages and in salaries.

Likewise respecting the number of salaried employees and wage-earners, the chances for misleading facts in this census are reduced to a minimum The data are taken from the pay-rolls, and applied to a certain day of the month. The industries in which the facts reported for this month are not typical are comparatively self-evident, and errors through comparison or by absolute statement are not likely to be serious.

The table of contents outlines each chapter fully, the character of the matter being indicated by such headings as "Introduction," "Summary," "Principal Tables," "Diagrams." Following the fifteenth chapter are six so-called General Tables (pages 507–793) and following this, four Appendices (pages 797–832). The volume also contains an elaborate "Index to Industries, by Chapters and by General Tables."

Of the Introduction, Chapter I, nothing needs to be said, save that there is here reproduced, in summary, the essential cautions and instructions issued with the schedules, with the Instructions to Special Agents, and with the Instructions for Editing and Revising the Schedule, as well as the salient points in which the 1909 schedules differ from and agree with those of the censuses immediately preceding it.

From the reviewer's viewpoint one of the chapters in Volume VIII, against which the most vigorous protest should be directed, is Chapter IV—Summary by States and Geographic Divisions. In this chapter the various states are ranked according to criteria furnished by data on the schedules—value of products, wage-earners, and value added by manufacture, being the controlling items. In Table 4, page 61, the ranking is according to amount and percentage of increase in value of products from 1899 to 1909; in Table 5, page 62, the states are grouped by value of products; in Table 7, pages 66–69, the states are ranked according to first, second, and third place, by industries (264); in Table 10, pages 70–76, the industries of the various states are ranked first, second, and third, as measured by value of products, etc.

Such a ranking process is indefensible for at least two good reasons, if for no others. First, the criteria upon which the ranking is made are for the most part meaningless or unreliable or both; and second, the form of ranking is without statistical merit. Concerning the former, sufficient has been said above; the unreliability of the latter may conclusively be shown by a single example taken from the Report under consideration. The following tabular statement compiled from Volume VIII, Tables 1 and 2, pages 40–43, and 45–47 respectively, is designed to show for two criteria for ten industries the unreliability of ranking by numerals.

NAME OF INDUSTRIES AND RANKING BY VALUE OF PRODUCT, AND VALUE ADDED BY MANUFACTURER, 1909.

Industry.	Value of Product, 1909.				
	Amount.	Rank of Industry.	Difference.		
			Amount.	Per Cent.	Rank.
Leather tanned, curried and finished	$327,874,187	18			
Butter, cheese, and condensed milk	274,557,718	19	$53,316,469	19.42	1
Paper and wood pulp	267,656,964	20	6,900,754	2.58	1
Automobiles, including bodies and parts	249,202,075	21	18,454,889	7.40	1
Smelting and refining lead	167,405,650	30	81,796,425	48.86	9
	Value added by Manufacture, 1909.				
Boxes, cigar	$4,178,038	164			
Soda water apparatus	4,113,059	165	64,979	1.58	1
Files	4,095,473	166	17,586	.43	1
Emery and other abrasive wheels	4,059,351	167	36,122	.89	1
Baskets, rattan, and willow ware	3,359,948	176	699,403	20.82	9

For value of product, in the instances chosen, a change in rank of 1 is shown to result from an absolute difference, varying from approximately seven millions to fifty-three and one third millions of dollars, or relatively, by a difference ranging from 2.58 per cent. to 19.42 per cent. In one instance a change in rank of 1 requires five eighths as large an amount as is necessary in another case to occasion a change in rank of 9. Similar, although not so startling differences—simply because the items chosen were taken from the upper end of the scale—assigned to the uniform unit—the passage from one to another position in the numerical scale—appear for the other criterion, value added by manufacture. Ranking of states or of industries in such a numerical hierarchy is done only in violation of the elementary truths of statistical methods. What justification, other than political, there is for elaborate ranking of states numerically is far from clear. The same method of stating relative standing is repeated at various other places throughout the three volumes, and unfortunafely in many places the numerical positions are restated at considerable length in the text.

A reading of Chapter VIII, Volume VIII, devoted to Expenses, leaves one skeptical of the real worth of the statistics collected under this caption. The figures suffer because of lack of comparability with those of former censuses, and we are constantly advised of their serious limitations when taken absolutely. The treatment of both text and tables, devoted to this subject, is restricted to five and one half pages, and is characterized by the lack of any positive comment as to the real value of the statistics included.

It is unnecessary, and probably out of place, in this review, to comment in detail on the topics treated and the method of treatment in the remaining chapters of this volume. The details relate to character of ownership, size of establishment, persons engaged in manufacturing industries, etc.

Chapter XV is devoted to a "Description of Individual Industries with Principal Statistics for Each," under fourteen headings, namely: Food and Kindred Products, Textiles, Iron and Steel Products, Lumber and its Remanufactures, Leather and its Finished Products, Paper and Printing, Liquor and Beverages, Chemicals and Allied Products, Stone, Clay and Glass Products, Metal and Metal Products other than Iron and Steel, Tobacco Manufacturers, Vehicles for Land Transportation, Railroad Repair Shops, Miscellaneous. In this chapter are given in broad outline the salient facts given in detail in Volume X.

Volume IX comprises a collection of Bulletins previously issued for the various States and Territories. It contains three and one half pages of "Introduction and Definition of Terms" and a treatment for each state under the following general headings: Comparative Summary for 1909, 1904, 1899, by Industries; Detailed Statement for the State by Industries, 1909; Detailed Statement for Cities, 1909. Slight deviations from this general form are made for the District of Columbia, Alaska, Hawaii, and Porto Rico. The data presented are taken from the general schedule for the most part.

Volume X pertains to the principal industries of the country, and is made up of Bulletins separately published. Statistics relating to character of materials used and products manufactured are given in great detail. No especial comment is necessary in addition to those comments made above relative to some of the classes of data collected and published, save that in many respects the suggestions would, in the case of this volume, be emphasized even more strongly.

As to the execution of the work from the standpoint of arrangement of tables, clarity in text analysis, and definiteness in table headings, etc., the Census office is to be commended. These three sturdy volumes are evidences—a little belated, according to a recent critic—of what can be accomplished in the collection, classification, and presentation of a great mass of statistical data. The mere ease with which comparisons can be made may in a certain sense help to explain what we are inclined to look upon as undue refinement in methods of presentation.

A few suggestions on technique may be hazarded. Text and footnote references are almost invariably made by table number only. This is hardly adequate when the tables are distinguished only by Roman and Arabic symbols. The insertion of page references generally would have facilitated the use of the Reports; and the appending of both page and column references to tables, in the reviewer's estimation, would have been a worthy innovation. An enormous saving of expense would have been effected by the expression of all items merely to the nearest thousands. This would in no wise have detracted from the purpose of the figures. Consistency seems to have been sacrificed in the refining process, which required figures—in many respects, and for many inquiries, hardly more than estimates—to be expressed to the nearest dollar in all tables. The three volumes under review are conspicuous for the absence of maps and display of all kinds. The maps which are used are those of the "dot"

type, the amount to be expressed being represented by the number and shading of dots. The merits of such a display over that of shading and cross-hatching are not clear. A feature of decided merit would have been the inclusion of a map at the beginning of each volume, on which were indicated the geographical divisions treated, such as Middle Atlantic, East North Central, etc. The divisions are not easily held in mind, and the summary by divisions would have been clearer if such a map had been appended for reference purposes.

The "Census statistics of manufactures are compiled primarily for the purpose of showing the absolute and relative magnitude of the different branches of industry covered, and their growth or decline" (Vol. IX, p. 9). So far as magnitude is reflected by data which primarily involve enumeration the Reports are not without considerable value. For inquiries involving evaluation the Reports do little more, either absolutely or relatively, than to indicate in the most general way the magnitude, growth, or decline of industry. The inclusion of inquiries involving evaluation may politically be necessary: tabulation in detail of the data received is warranted by neither administrative urgency nor statistical merit.

HORACE SECRIST.

Northwestern University.

THE CENSUS OF MINES AND QUARRIES FOR 1909.

The Census of Mines and Quarries for 1909, which was prepared under the immediate supervision of Isaac A. Hourwich and under the general management of Directors E. Dana Durand and Wm. J. Harris, is a much smaller volume than its predecessor, the Census of 1902, the number of pages having been reduced from 1,151 to 369. The reduction in the size of the volume is not accompanied by a corresponding reduction in the quantity of statistics furnished, but is due to the elimination of a large amount of the interesting descriptive material contained in the preceding census. Since changes in mines and methods have not been very striking, it was doubtless unnecessary to revise most of this part of the work and the present volume admirably answers the purpose of bringing forward seven years the figures of 1902.

The recent census follows the plan of the preceding enumeration as regards the principal outline. A new feature, however, is the classification of operators into those doing manual labor in their mines and those not so participating. This is certainly a useful distinction, for the millionaire coal baron has little in common with the operator of an insignificant drift producing a few tons a month for neighborhood use. This census continues the established plan of separating salaried employees from wage-earners. The studies of capital invested, primary horsepower, and expenses of production resemble, in most respects, those made by the last census. However, certain omissions of importance should be noted: The new census fails to give any data concerning capitalization and interest

and dividends paid thereon and also omits all statistics of daily wages. In place of the latter, there has been inserted a classified record of the hours worked per day.

The loss of the statistics of stocks and bonds issued does not seem to be of great moment since the value printed on the face of a stock certificate represents, too often, only the limits of the imagination of the promoters. The amount of interest and dividends paid does, however, furnish one of the best possible sources of information concerning the net returns of the business and it would seem that these statistics might, with profit, have been continued.

In this, as in every other branch of industry, a classification of workmen according to wages received, is a highly useful variety of statistical information, for average wages fail to furnish the details requisite to a study of the earnings of the different strata of laborers.

A new feature of this census which is worthy of attention is the inclusion of statistics concerning the extent and tenure of the land holdings devoted primarily to the mining industry. The tenure is probably even more interesting than the area occupied, for the latter is not necessarily closely related to value or productive power.

The study of the concentration of control of the mining industry has been made more complete by taking into consideration in the classification of operators, the number of wage-earners employed as well as the value of products.

The 1909 volume makes almost no comparisons with the figures for 1902 and those comparisons given in the Abstract of the Census are far from exhaustive. It may, therefore, be worth while to note a few of the more striking changes recorded. During the seven-year interval, the number of mines in the continental United States is shown to have increased from 155,642, to 193,688, a net gain of approximately one fourth while the number of operators was reduced from 46,858 to 23,664 a decrease of almost one half. A closer examination shows, however, that this remarkable contraction did not result from concentration of control but occurred principally in the oil fields and was almost wholly due to the exclusion of some 29,000 representatives of the Standard Oil company who were, in 1902, classed as independent operators.

The number of salaried persons has risen from 40,812 to 46,475, a change of less than one sixth, but the number of wage-earners has increased from 595,366 to 1,086,782, a rise of over four fifths. This change occurred principally in the production of coal, iron, and petroleum. In 1902, the average salaried man received only $1,022 while in 1909 his salary had increased to $1,202. On the contrary, the average wage-earner, in the first period earned $643, while, in the second period, he received but $552. The income of the salaried man has therefore tended to keep pace with rising prices but the wage-earners now receive less per man than when the price level was relatively low. This probably does not mean that the same grade of labor is now receiving a lower wage, but that there has been an influx of an army of low-grade foreign labor into the unskilled positions.

During the seven years, the total value of mineral products rose from $796,826,417 to $1,238,410,322, an increase of 55 per cent. This represents an output per person employed of $1,195 in 1902 and of $1,087 in 1909. Thus, despite the rising price level, the value product per worker diminished. A large increase in the use of machinery is indicated by a rise in the horsepower utilized from 2,867,562 to 4,722,879, but even this expansion of 65 per cent. in the use of power failed to keep pace with the number of wage-earners engaged in the industry. On the other hand, the power used declined from 4.8 to 4.3 horsepower per laborer. Both these facts would indicate a growth in the crude utilization of unskilled labor rather than an increase in the percentages of highly skilled machine operators.

Some interesting changes and conditions are revealed by the statistics on concentration of ownership. The small operators still maintain themselves, but the large operators are annexing most of the expansion in the business. In 1902, 84 per cent. of the coal was produced by concerns having a product value at $100,000 or over. In 1909, this same class of concerns extracted 90.2 per cent. of the coal. Firms turning out this same value product of $100,000 or over mined 92.1 per cent. of the iron in 1902 and 97.3 per cent. in 1909. In the mining of precious metals in 1902, 72.9 per cent. was produced by operators of the same class while, in 1909, 84.5 per cent. came from these large producers. In gas and oil production, the opposite tendency is observed for, in the first period, the product of these large scale operators comprised 88.4 per cent. of the total value while, at the last census, concerns of this size controlled but 72.7 per cent. of the entire value of the product. These figures all make it evident, however, that small entrepreneurs, while numerous, play but a very minor rôle indeed in the extraction of minerals from the earth.

As regards the hours of labor, one is impressed with the general prevalence of the ten-hour day in the iron mines, the limestone quarries, and the phosphate beds; of the nine-hour day in the anthracite fields, and of the eight-hour day in most of the other lines of mining.

One might add indefinitely to similar comments on the contents of the volume. Complete individual reports appear for each state and for each of the more important of the mineral products.

While it is manifestly impossible to obtain statistics concerning all the facts which it is desirable to know, there are a few omitted points regarding which it would seem that the public ought to be informed. The previous classification of wage-earners according to daily wages might well have been maintained and should be continued. A question much more difficult to answer, but about which it seems important to be informed, is concerning the actual number of days worked by the average individual miner. Turning to the side of valuation, even rough estimates of the present cost of reproduction of the machinery, buildings, tracks, and timbering in the active workings and of the present value of the mineral deposits themselves would be helpful in order that we might learn something about the total mine value and its division into capital goods and land value.

The total amount paid out in dividends and interest should be recorded from year to year in order that the real profitableness of mining operations to the investor might be ascertained.

On the whole, the work of Mr. Hourwich and his associates is to be highly commended for its compactness, uniformity of tabulation and presentation throughout, its logical form, and its clarity of statement. In all of these respects, this volume, like the others planned by Director Durand and completed by Director Harris, seems to mark a decided step in advance in the presentation of census statistics to the reading public.

WILLFORD I. KING.

University of Wisconsin.

REPORTS ON POPULATION, THIRTEENTH CENSUS OF THE UNITED STATES, 1910.

VOLS. I, II, AND III. WASHINGTON: GOVERNMENT PRINTING OFFICE, 1913.

It would be manifestly impossible in limited space to adequately review this group of volumes, comprising an aggregate of nearly 3,800 pages, which, together with an additional volume on "Occupations" (not here considered) constitute the published material on the single subject of Population, as enumerated in the census of 1910. There are, however, certain features of these reports which call for special consideration. While the subject-matter of these reports, considered as a group, does not differ signally from the subject-matter of the reports on Population of the previous census, the method of presentation of the material is distinctly different.

In 1910, when the method of presentation of the results of the census was under consideration, a press notice was issued by the Bureau of the Census, calling attention to the "Radical and Practical Departure from Previous Census Methods." No one will deny that the method of presentation of the 1910 census returns was at least a "radical" departure from that of the previous census and, while it may be open to question as to whether the departure was a "practical" one, it appears to the writer, who has had occasion to observe the use made of the population reports by the general public, that the method of presentation of the later reports has given more general satisfaction because it has resulted in accomplishing the very purpose for which the change was made, as expressed in the bulletin above referred to, namely, "To simplify and make more accessible the census data, so that they can be readily used, not merely by expert students and statisticians, but by the average citizen." With reference to the method of presenting the population statistics of 1900 it was stated in the bulletin that:

"In the reports of the previous census [1900] practically all the information was arranged with a view to facilitating comparisons between different localities with respect to a given subject, and not with a view to enabling the people of a given locality to ascertain readily all the facts with regard to that locality.

"Thus, the numbers of inhabitants for all the so-called minor civil divisions—townships, villages, etc.—of all the states were presented in one table, the same figures for the incorporated places of all the states in another

table, the various classes of population details regarding all the counties in the United States in another series of tables, etc. This meant that a person who wished to look up the statistics of minor civil divisions, incorporated places and counties for his own state alone had to look in several widely separated places for them. Even a person who desired to find information with regard to his own county alone had to consult a large number of scattered tables.

"In one table, for example, he would find the absolute number of inhabitants for his county side by side with similar figures for every other county in the United States. He would have to go to another table, where again the figures for all the counties of the country appeared, to find the figures distinguishing the population of his county according to color and native and foreign birth. He would have to turn over many pages more before he came to the figures for his county with regard to the country of birth of the foreign born. Still further over he would find the figures for his county regarding males 21 years of age and over; in another place, in fact, in another volume, the figures regarding illiteracy; still elsewhere those regarding the school attendance of the children. In each of these tables the figures for any one county were presented from left to right, the various counties being listed down the side of the page and the subjects across the top.

"The result of this method of presentation was that very few of the inhabitants of any county ever saw or made any use of the statistics regarding that county, except possibly those of the mere number of inhabitants. Similarily, in the 1900 census report, the statistics of any given city or village had to be picked out from many scattered places." . . .

The validity of the above criticism of the method of presenting the population returns of 1900 will be readily recognized by referring to the following summary of the principal captions of the two volumes on population for that census.

REPORTS OF THE TWELFTH CENSUS.

VOLUME I.

GENERAL REPORT AND ANALYSIS. (pp. i-ccxix.)
- Introduction.
- Population of States and Territories.
- Density of Population.
- Center of Population and its Median Point.
- Population of Counties.
- Population of Incorporated Places.
- Urban Population.
- Rural Population.
- Sex.
- General Nativity.
- Color.
- State or Territory of Birth.
- Country of Birth.
- Foreign Parentage.
- Citizenship and Years in the United States.

MAPS AND PLATES.

GENERAL TABLES (Nos. 1-92) (pp. 1-1006).
- States and Territories.
- Counties.
- Minor Civil Divisions.
- Cities, Towns, Villages and Boroughs.
- Sex, General Nativity and Color.
- State or Territory of Birth.
- Country of Birth.
- Foreign Parentage.
- Citizenship and Years in the United States.

VOLUME II.

GENERAL REPORT AND ANALYSIS. (pp. i-ccxxiii.)
- Elements of the Population.
- Ages.
- Persons of School Age.
- Males of Militia Age.
- Males of Voting Age.
- Conjugal Condition.
- School Attendance.
- Illiteracy.
- Can not speak English.
- Occupations.
- Dwellings and Families.
- Proprietorship of Homes.
- The Territory of Alaska.
- The Territory of Hawaii.
- Appendix—Form of Schedule.

MAPS AND PLATES.

GENERAL TABLES (Nos. 1-115) (pp. 1-754).
- Ages.
- School, Militia and Voting Ages.
- Conjugal Condition.
- School Attendance.
- Illiteracy.
- Can not speak English.
- Occupations.
- Dwellings and Families.
- Proprietorship of Homes.

The following summary of the matter in the 1910 reports has been prepared by selecting, in so far as possible, the same principal captions as those appearing in the 1900 reports, in order that a direct comparison may be made between the order of presentation of the material in the respective reports.

REPORTS OF THE THIRTEENTH CENSUS.

VOLUME I. (pp. 1-1369).

(This volume constitutes the General Report and Analysis.)

SUMMARY OF CHAPTERS.

INTRODUCTION.

I. Number and Distribution of Inhabitants.
Introduction.
Population by Divisions and States.
Apportionment of Representation.
Area and Density of Population.
Centre of Population and Median Lines.
Urban and Rural Populations.
Communities Classified According to Size.
Cities and their Suburbs.
Population of Individual Cities.
Population of Counties of Equivalent Divisions.
Principal Tables.

II. Color or Race, Nativity and Parentage.
III. Sex Distribution.
IV. Age Distribution.
V. Marital Condition.
VI. State of Birth of the Native Population.
VII. Country of Birth of the Foreign-Born Population.
VIII. Country of Origin of the Foreign White Stock.
IX. Mother Tongue of Foreign White Stock.
X. Year of Immigration of Foreign-Born Population.
XI. Voting Age, Militia Age and Naturalization.
XII. School Attendance.
XIII. Illiteracy.
XIV. Inability to Speak English.
XV. Dwellings and Families.
XVI. Ownership of Homes.
App. Form of Schedule.

VOLUME II. (pp. 1-1160).

REPORTS BY STATES.

Alabama to Montana.

(The following is the form of presentation for each State and Territory).

Alabama.

CHAPTER I—NUMBER OF INHABITANTS.

Explanatory and Analytical Text and Tables.
Maps.

GENERAL TABLES.

I. Poplation of minor civil divisions: 1910, 1900, and 1890.
II. Population of incorporated places: 1910, 1900, and 1890.

CHAPTER II—COMPOSITION AND CHARACTERISTICS OF THE POPULATION.

Explanatory and Analytical Text and Tables.
Map.

GENERAL TABLES.

I. Composition and Characteristics for the State and for Counties.
II. Composition and Characteristics for Cities of 25,000 or more.
III. Composition and Characteristics for Cities of 10,000 to 25,000.
IV. Composition and Characteristics for places of 2,500 to 10,000.
V. Composition and Characteristics for wards of cities of 50,000 or more.
Notes regarding changes in boundaries, etc.

Other states are considered in alphabetical order, the form of presentation being the same as under *Alabama*.

VOLUME III. (pp. 1-1225).

REPORTS BY STATES.

Nebraska to Wyoming. Alaska, Hawaii, Porto Rico.
(Same method of consideration as in Vol. II.)

On comparing the above summaries or outlines of the reports of the respective censuses one will observe that the later arrangement provides, in a single volume, for the general summaries and analyses contained in the first portion of each of the two volumes of the 1900 census; but the general tables giving the information in minute detail with elaborate comparisons for the minor civil divisions, such as counties and the small cities and towns are lacking. For students and expert statisticians this lack undoubtedly works a hardship, rendering it necessary for them, when making a thorough study of some particular phase of population statistics where comparisons between such minor civil divisions of different states are required, to compile the data themselves by assembling the details from the sections devoted to the several states. But any inconvenience to which those engaged on special inquiries of this nature may be subjected is far outweighed by the

great convenience which the ordinary citizen enjoys through having immediately accessible in a single volume, in compact form, the principal data for that particular locality in which he may be especially interested.

The adoption of this method of presenting the returns by localities made it possible to carry out the plan, as announced in the press notice, "to publish for each state a bulletin which [would] contain at least the more important figures derived from the population census, both for the state as a whole, and for its counties, cities, and minor civil divisions." Notwithstanding the delay in the publication of a large number of these bulletins—a very prolonged delay in certain instances—it is assuredly true that the public was in possession of those portions of the census returns which are principally in demand, much earlier than would have been the case had the method of presentation of the returns followed that of the preceding census. Furthermore, the advance bulletins were in the form in which they were finally incorporated in the bound reports, thereby rendering unnecessary further composition of those portions of the report.

With reference to the bulk of printed matter in the reports of the two censuses, it should be pointed out that the 1900 population returns were published in *two* volumes, together comprising slightly over 2,200 pages, while the 1910 returns were published in *three* volumes, together comprising about 3,750 pages. In part, this increase was due to some duplication of figures in the general and state tables and, in part, to additional matter, principally text discussion, for the several states not included in the 1900 reports. It was the intention, however, to avoid duplication of the figures for counties and for the smaller cities, and, consequently, we find that information of this character was published only in the state bulletins. On the other hand, the statistics of the several states and larger cities were published in comparative tables in the first volume, or general report, because it was believed that "Persons who have this general interest in the statistics desire to consider the figures for given states and large cities as elements or sections of the nation, rather than as units standing by themselves, and to have them in form convenient for comparison." In order, therefore, to accomplish this purpose of meeting the demand for data for states and the larger cities presented both in comparative form and individually, it was necessary to duplicate the figures of this nature.

It might naturally be supposed that the printing of such a large number of additional pages (about 1,500) would increase the cost of meeting the public demand for the 1910 reports. Such would have been the case were it not for the fact that in a great majority of instances the demand is purely for *local* statistics and can be readily supplied by furnishing a copy of the section pertaining to a particular state under consideration; for example, by supplying a paper-covered bulletin of only 79 pages where one wishes merely the statistics for the State of New York, or one of 46 pages where one wishes merely the statistics for Massachusetts. And even should one wish comparative figures for the several states or larger cities, the demand can be met by supplying in a single volume of less than 600 pages the "Abstract" of the census, which, as described by the Director of the Cen-

sus, contains "in condensed form the principal statistics gathered at the decennial enumeration of 1910 on the subject of population (except occupation statistics), agriculture, manufactures and mining, and gives figures on all subjects for the United States as a whole, and for the different states, together with the statistics relating to population and manufactures for the principal cities." This Abstract has been issued in a series of separate editions for each of the several states and territories, each of which editions contains the abstract, as such, together with a supplement containing information in greater detail for the state to which it refers, which embraces all of the census results published concerning that state, its counties, cities, and other civil divisions, except as to occupations.

The writer has found that the possession of this abstract with its supplement for Massachusetts has enabled him to supply information in answer to nearly all of the inquiries relative to population statistics which have been referred to him by citizens of Massachusetts, in so far as such inquiries are covered by the enumeration in 1910.

While the change in the method of presenting the population statistics, and indeed, the other statistics of the census in 1910, does not entirely meet the needs of those who are engaged in the study of a particular subject in which comparisons between the smaller localities of several states are made, and while the change of method may have caused some confusion because of the necessity, on the part of those who are in the habit of consulting the census reports, of familiarizing themselves with a new method of presentation, it is undoubtedly true that never before have the returns of the census been so accessible to the general public, and when succeeding reports shall have been presented on the plan of the last census the comparability of census returns from period to period will have been greatly facilitated.

ROSWELL F. PHELPS.